

**GYNÆCOLOGY**  
**FOR NURSES**  
**AND**  
**GYNÆCOLOGICAL NURSING**

**COMYNS BERKELEY**



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GYNÆCOLOGY FOR NURSES AND  
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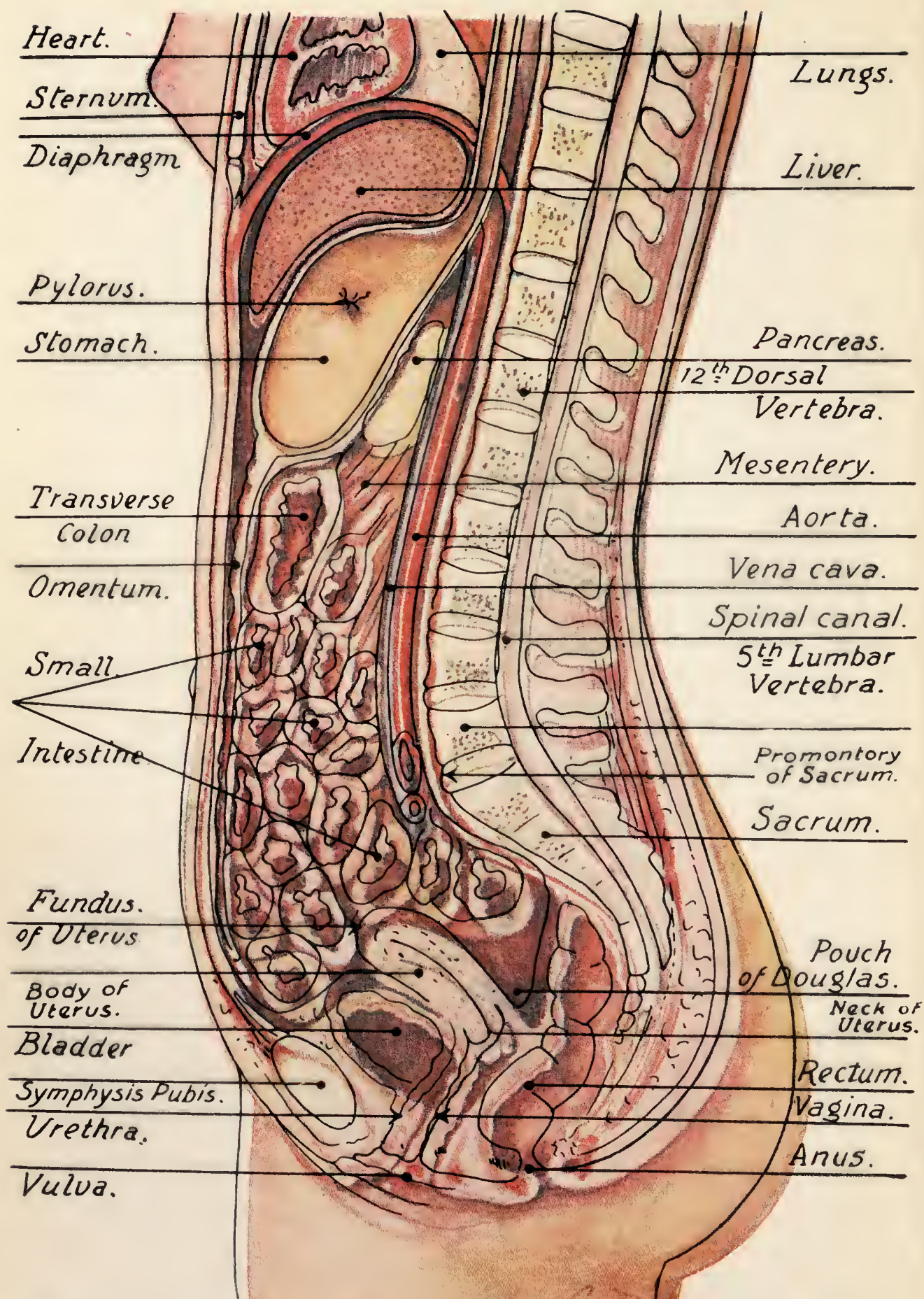


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SECTION THROUGH THE FEMALE BODY SHOWING THE PECTORAL, ABDOMINAL, AND PELVIC ORGANS.



# GYNÆCOLOGY FOR NURSES AND GYNÆCOLOGICAL NURSING

INCLUDING THE SUBJECTS ENUMERATED, UNDER "GYNÆCOLOGY  
AND OBSTETRICS", IN THE "SYLLABUS OF LECTURES AND  
DEMONSTRATIONS FOR EDUCATION AND TRAINING IN GENERAL  
NURSING" ISSUED BY THE GENERAL NURSING COUNCIL

BY

COMYNS BERKELEY

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OXFORD, SHEFFIELD AND WALES, TO THE CONJOINT BOARD OF

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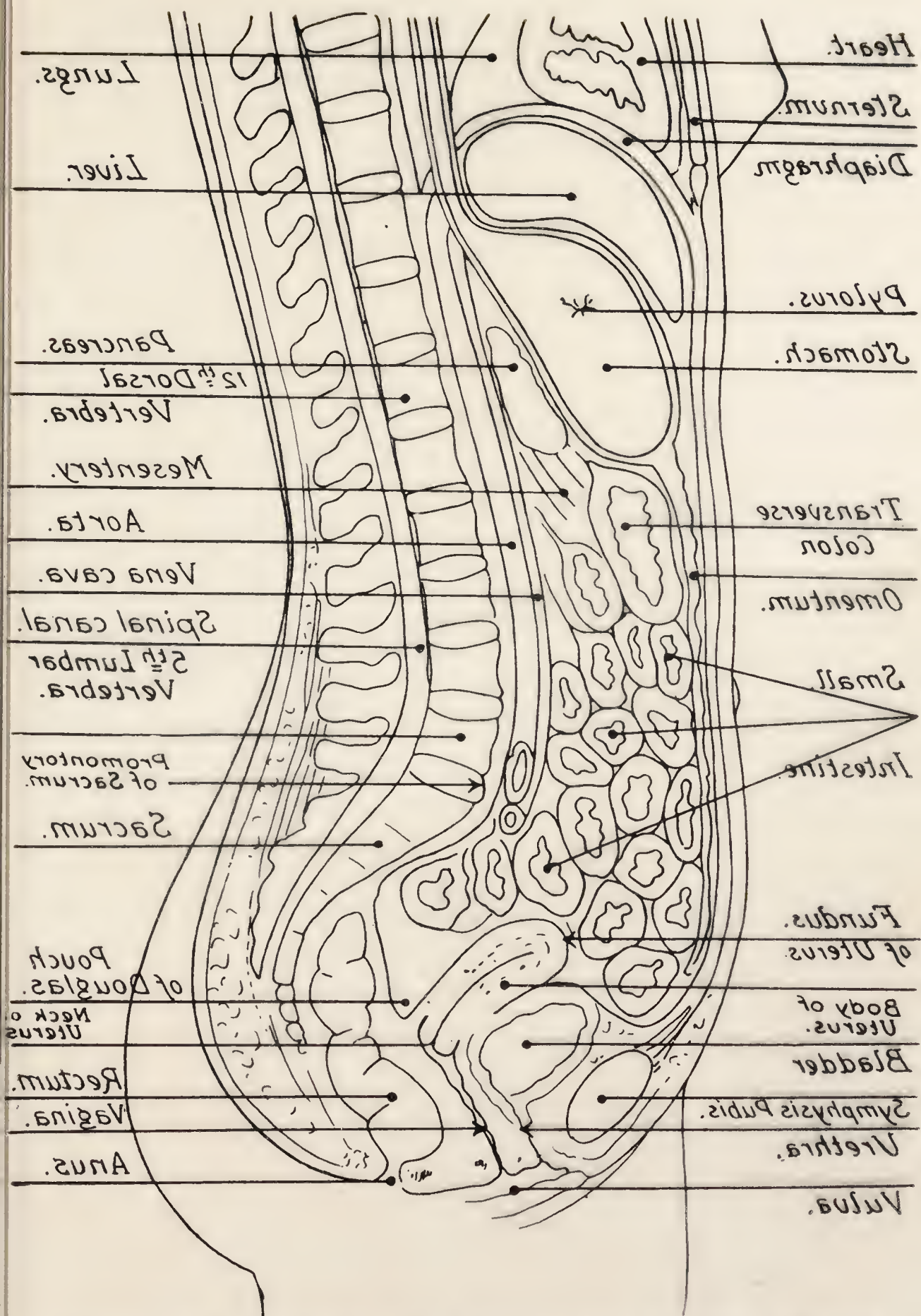
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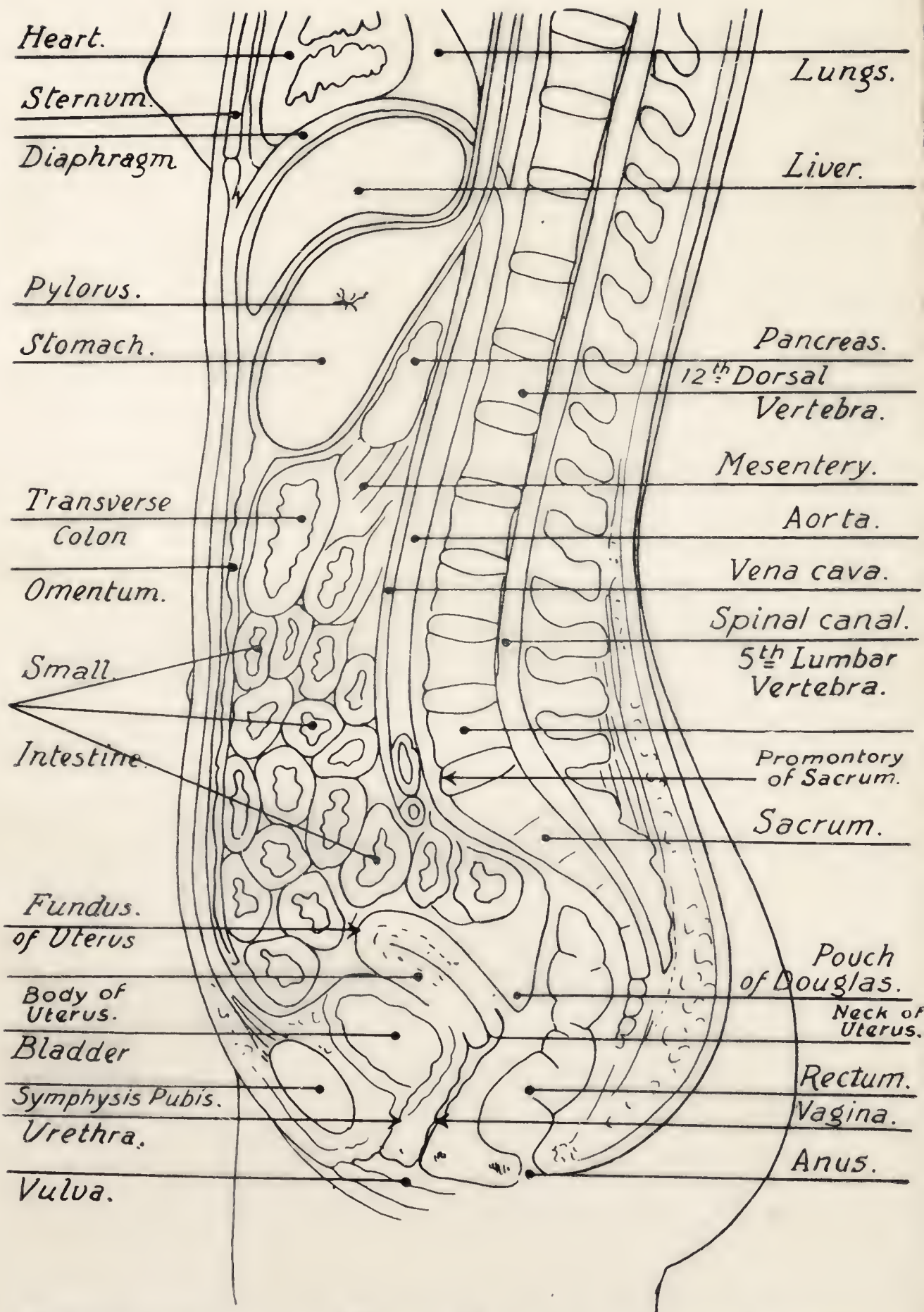


ABDOMINAL, AND PELVIC ORGANS.  
SECTION THROUGH THE FEMALE BODY SHOWING

SECTION THROUGH THE FEMALE BODY SHOWING THE PECTORAL,







SECTION THROUGH THE FEMALE BODY SHOWING THE PECTORAL, ABDOMINAL, AND PELVIC ORGANS.





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## PREFACE TO THE SIXTH EDITION.

THE sixth edition of this book has been thoroughly revised and in several parts rewritten, notably the chapters on Hormones, Infection, Immunity, X-rays and Radium. New chapters have been added on Abortion and Anæsthetics. Those complications of midwifery which are associated with Hæmorrhage have been included under this term, on the assumption that a State Registered Nurse, without the training necessary for a midwife, might be called to an urgent case of ante-partum or post-partum hæmorrhage, because the assistance of a doctor or midwife could not forthwith be obtained.

I am greatly obliged to Miss E. Pearce, the Sister Tutor of the Middlesex Hospital, for the great trouble she has taken in reading the proof sheets, and to Dr. S. Russ, the Professor of Physics, for valuable assistance in the chapter on X-rays and Radium.

Before preparing this New Edition I took the opportunity of writing to the Sister Tutors of all the teaching hospitals in England, Wales, Scotland, Northern Ireland and the Irish Free State, on the chance that if they used this book for their pupils they might suggest some improvements. I had one answer only and, therefore, presume that this book fulfils the purpose for which it was written, namely, as a guide to those State Registered Nurses who may be called upon to nurse a gynæcological case; for senior nurses attached to hospitals, and as a textbook for the Gynæcological Section of the examination of the General Nursing Council.

COMYNS BERKELEY.

*November, 1933.*



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# GYNÆCOLOGY FOR NURSES AND GYNÆCOLOGICAL NURSING.

## PART I.

### ANATOMY.

#### CHAPTER I.

##### STRUCTURE OF THE PELVIS, GENITAL ORGANS, BREASTS, URINARY ORGANS, AND RECTUM IN THE FEMALE.

##### Structure of the Pelvis.

THE female pelvis consists of four bones : the two innominate bones, the sacrum and the coccyx (Fig. 1).

**The Innominate Bone.**—The innominate bone is composed of three separate parts, the ilium, the ischium and the pubis, which meet at the hip joint in a hollow called the acetabulum, and which are firmly united to one another between the ages of 20 and 25 years.

The *Ilium* is that expanded portion of the innominate bone which forms the hip. The *Ischium* is the lowest portion of the pelvis, and that part of it upon which the body rests, when in a sitting posture, is called the tuberosity. The *Pubis*, with its fellow on the opposite side, forms the front of the pelvis, and their point of junction is known as the symphysis pubis.

**The Sacrum.**—The sacrum consists of the upper five of the lowest nine vertebræ of the spinal column, and these are fused into one solid piece of bone. The front surface of the

sacrum is curved and forms the back of the pelvic cavity. The sacrum is perforated by eight holes through which nerves pass from the spinal cord into the pelvic cavity, to be distributed to the pelvic contents, the legs and the feet. The prominence at the top of the sacrum, formed by the first sacral vertebra articulating with the last or fifth lumbar vertebra, is known as the promontory of the sacrum. Each side of the sacrum articulates with the corresponding innominate bone, in the region of the ilium, the joint being called the sacro-iliac joint.

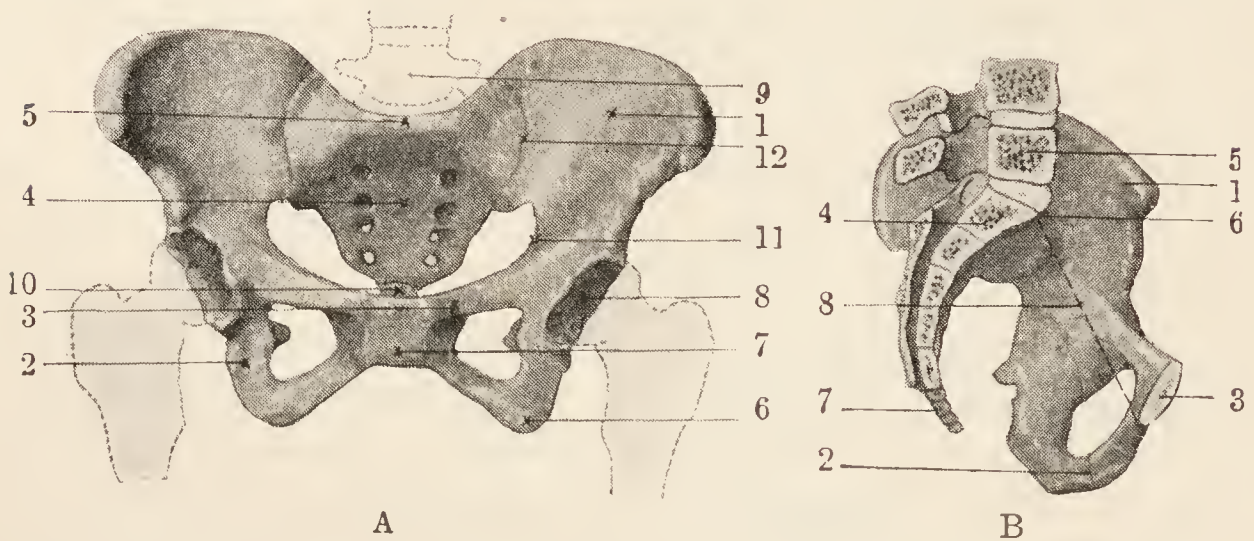


FIG. 1.

- A.—The pelvis, front view. 1. Ilium ; 2. Ischium ; 3. Pubis ; 4. Sacrum ; 5. Promontory of sacrum ; 6. Tuberosity of ischium ; 7. Symphysis pubis ; 8. Acetabulum ; 9. Lumbar vertebra ; 10. Coccyx ; 11. Brim of pelvis ; 12. Sacro-iliac joint.
- B.—Pelvis and fourth and fifth lumbar vertebræ divided in half. 1. Ilium ; 2. Ischium ; 3. Pubis ; 4. Sacrum ; 5. Fifth lumbar vertebra ; 6. Promontory of sacrum ; 7. Coccyx ; 8. Diagonal conjugate measurement.

**The Coccyx.**—The coccyx consists of the four last vertebræ in the spinal column, and these are also fused into one solid piece of bone. The coccyx forms the lowest part of the back of the pelvis and is joined to the fifth sacral vertebra by the sacro-coccygeal joint.

### The Pelvis as a Whole.

The female pelvis has a special significance of its own, since through it the child has to pass before it is born. If, therefore,

the pelvis is smaller than normal, it is obvious that the progress of the child, during its birth, may be hindered or even prevented. If the dried pelvis of a female is examined, it will be found to consist of two parts which are divided by a ridge of bone known as the brim of the pelvis. The brim is formed by the upper margins of the pubic bones in front, the junction of the ilium with the ischium at the sides, and the front of the promontory of the sacrum at the back. That portion of the pelvis above the brim is known as the false pelvis, and that part below the brim is called the true pelvis.

**False Pelvis.**—The false pelvis takes no part in the mechanism of labour, and its importance in midwifery is concerned only with certain measurements which can be taken from various points on its surface and which serve to indicate, in some degree, the size and shape of the true pelvis.

**True Pelvis.**—From the point of view of the mechanism of labour the true pelvis is all-important. Clothed with its muscles and fascia, it is of such a size that the head of the child when in its correct position, namely that of flexion, can just pass through the true pelvis by turning in a certain direction during its transit. There are certain measurements of the true pelvis which have a bearing on the mechanism of labour. The most important measurement which can be taken by a nurse is that between the under surface of the symphysis pubis and the promontory of the sacrum. This diameter is known as the *diagonal conjugate* and is, normally,  $4\frac{3}{4}$  inches long. By subtracting  $\frac{3}{4}$  of an inch from the diagonal conjugate *the true conjugate* diameter, measured from the tip of the sacral promontory to the back and just below the top of the symphysis pubis, can be estimated; this, normally, is 4 inches long. As the true conjugate is the smallest diameter of the pelvis through which the head of the child will have to pass, its importance can easily be realized. If, therefore, the diagonal conjugate is less than  $4\frac{3}{4}$  inches long the progress of the child will be impeded, or arrested, according to the amount of diminution which is present.

The normal pelvis of a woman is shallower and wider than that of a male. The arch formed by the two pubic bones is wider, and the measurements both at the inlet of the true pelvis and at its outlet are larger. The sacro-iliac, sacro-



coccygeal and inter-pubic joints become softer during pregnancy, thus allowing of a little stretching. These differences in the female pelvis facilitate the passage of the child.

### The Pelvic Floor.

Just as the floor of a room supports the various articles of furniture resting upon it, so the pelvic floor, normally, supports the pelvic contents in their correct position. There is this difference, however, that whereas the floor of a room is rigid and complete, the floor of the pelvis has three apertures in it to allow of defæcation, micturition, and childbirth. Moreover, the tissues composing the pelvic floor, composed as they are of muscles, ligaments, connective tissue, blood-vessels, lymphatics and nerves, are yielding for the same purposes. The most important of these structures, from an obstetrical and gynæcological point of view, are the muscles known as the *levator ani* (Fig. 2). During labour, due to the fact that these muscles, with the rest of the pelvic floor, slope downwards and forwards, from the back of the pelvis to its front, and downwards and inwards from the sides of the pelvis to the middle line of the pelvic floor, the head of the child is rotated and its occiput is directed forwards to the vaginal orifice. As the result of labour the levatores ani and the *perineum* may be torn, leaving avenues for the spread of septic infection during the early days of the puerperium, or stretched so that, later on, the woman may suffer from "falling of the womb."

The female genital organs may be divided into external and internal.

### External Genital Organs.

The external organs of generation, which are together spoken of as the vulva, include all the structures that can be seen between the pubes and the perineum and when the labia majora are separated, as follows:—

**Mons Veneris.**—The mons veneris is a pad of fat in front of the pubic bones, and is after puberty covered with hair. It forms the anterior border of the vulva, and should be shaved prior to an abdominal or vaginal operation.

**Labia Majora.**—The labia majora, which form the lateral boundaries of the vulva, are continuous in front with the mons veneris and behind with the perineum, and are con-

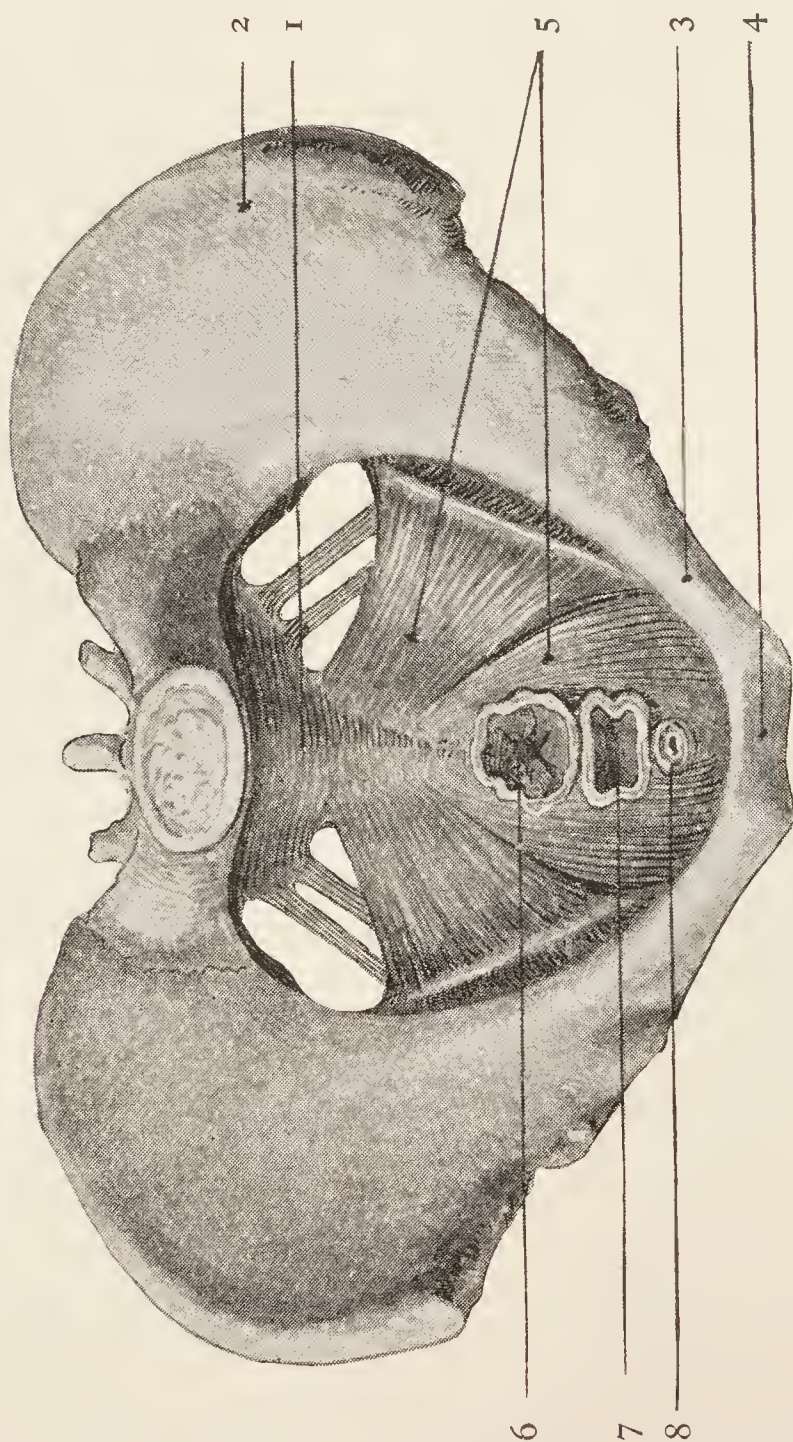


FIG. 2.

Floor of the pelvis. The uterus, Fallopian tubes, ovaries, broad ligaments, vagina, bladder, rectum; cellular tissue, blood-vessels, and nerves removed. Looking down upon it from above: 1. Sacrum; 2. Ilium; 3. Pubis; 4. Symphysis pubis; 5. Levator ani muscles; 6. Rectum cut across; 7. Vagina cut across; 8. Urethra cut across.

nected at their posterior extremities by a fold of skin known as the *fourchette* which itself forms the posterior border of the vulva. The labia are composed of skin, fat, connective tissue,



unstriped muscle, blood-vessels, lymphatics and nerves. The outer surface of each labium majus is covered with skin and after puberty with hair, and it contains many sebaceous glands. The inner surface is smooth, moist and devoid of hairs. The labia majora represent the scrotum of the male. Each labium majus contains, in its posterior part, a small gland known as *Bartholin's gland*, so called after the anatomist of that name. This gland secretes a clear, sticky fluid which escapes by a small duct through an orifice just outside the hymen.

**Labia Minora or Nymphae.**—The labia minora are situated between the upper portions of the labia majora and are entirely seen only when the labia majora are separated. In front each labium divides into two folds, which, uniting with those of the opposite side, surround the clitoris. The two upper folds form the prepuce, and the two lower the frenum of the clitoris. The posterior extremities of the labia minora gradually blend with the inner surface of the labia majora at their lower third. They are composed of skin and contain connective tissue, a little erectile tissue in the form of unstriped muscle, blood-vessels, lymphatics and nerve endings. The nymphae are hairless.

Care must be taken, when preparing a patient for a vaginal operation, properly to clean the space between the under surface of the prepuce and the clitoris, as in this situation a yellowish material collects.

**Clitoris.**—The clitoris is situated at the apex of the vestibule and surrounded by the folds of the labia minora. It represents the penis of the male. It is composed of a small mass of erectile tissue and is covered with a very sensitive epithelium. Care should be taken, when passing a catheter, to avoid touching the clitoris.

**Vestibule.**—The vestibule is a smooth triangular surface situated at the anterior part of the vulva. Its apex is formed by the clitoris, its sides by the labia minora, and its base by the anterior attachment of the hymen. Just above the centre of the base can be seen the urethral orifice.

The nurse must always remember to swab the vestibule, with some antiseptic solution, just before passing a catheter.

**Hymen.**—The hymen forms the boundary between the

FIG. 3.



FIG. 4.

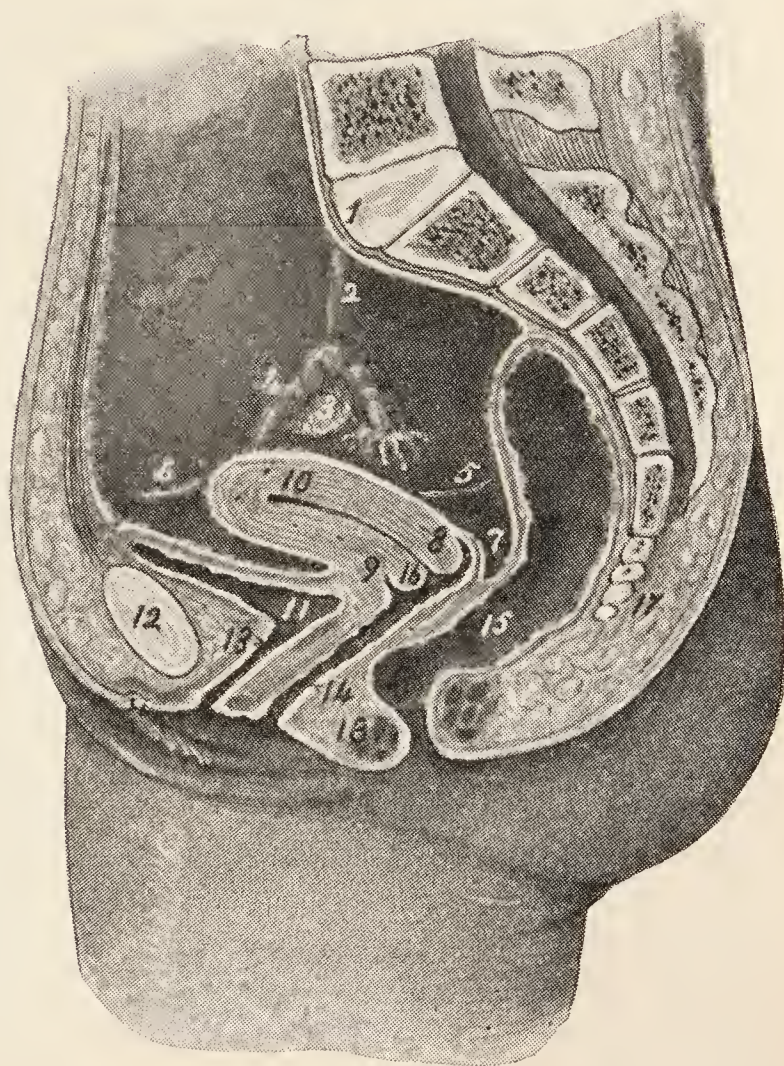


FIG. 3.—EXTERNAL GENITAL ORGANS.

M.V. Mons veneris.

1. Labia majora.

2. Clitoris.

3. Vestibule.

4. Urethral orifice.

5. Labia minora.

6. Hymen.

7. Vaginal orifice.

8. Fourchette.

9. Perineum.

10. Anus.

FIG. 4.—SAGITTAL SECTION OF THE PELVIC ORGANS.

1. Promontory of the sacrum.

2. Ovario-pelvic ligament.

3. Ovary.

4. Fallopian tube.

5. Utero-sacral ligament.

6. Round ligament.

7. Pouch of Douglas.

8. Posterior lip of cervix.

9. Anterior vaginal fornix.

10. Body of the uterus.

11. Bladder.

12. Symphysis pubis.

13. Urethra.

14. Vagina.

15. Rectum.

16. Anterior lip of cervix.

17. Coccyx.

18. Perineum.



external and internal genital organs. It is composed of connective tissue covered on each side by squamous epithelium, and is perforated in its centre. It varies in consistence, in some cases being so soft and yielding that a vaginal examination can with ease be made in virgins, in others it is so tough and resistant that, even in married women, it has to be incised. In abnormal conditions the hymen may be perforated in more than one place or, and this is a serious malformation, it may not be perforated, thus leading, after puberty, to the retention of the menstrual discharge. As a result of childbirth the hymen is split, and portions of it slough, the pieces that are left being called *carunculæ myrtiformes*.

**Fossa Navicularis.**—That part of the vulva between the attachment of the hymen and the fourchette is known as the fossa navicularis, and it is on this surface that the primary sore of syphilis is frequently found in an infected woman.

**Perineal Body.**—The perineal body is a triangular structure, somewhat over an inch in length, composed of skin, connective tissue, muscle, blood-vessels and nerves. Its apex is situated at the point where the rectum and vagina first meet, and its base, covered by the skin stretching between the orifices of the vagina and anus, is called the *perineum*. The lower inch of the posterior wall of the vagina is closely attached to the anterior surface of the perineal body, and the lower inch of the anterior wall of the rectum is closely attached to its posterior surface.

The perineal body may be torn or stretched during childbirth and, as it forms part of the pelvic floor which helps to support the uterus, such injury favours prolapse of the uterus, or falling of the womb as it is commonly termed.

### Internal Genital Organs.

The internal genital organs comprise the following structures :—

**Vagina.**—The vagina is, unless it is distended, a closed muscular tube, lined with membrane similar to skin without its horny layer and plentifully supplied with blood-vessels, lymphatics and nerves.

FIG. 5.

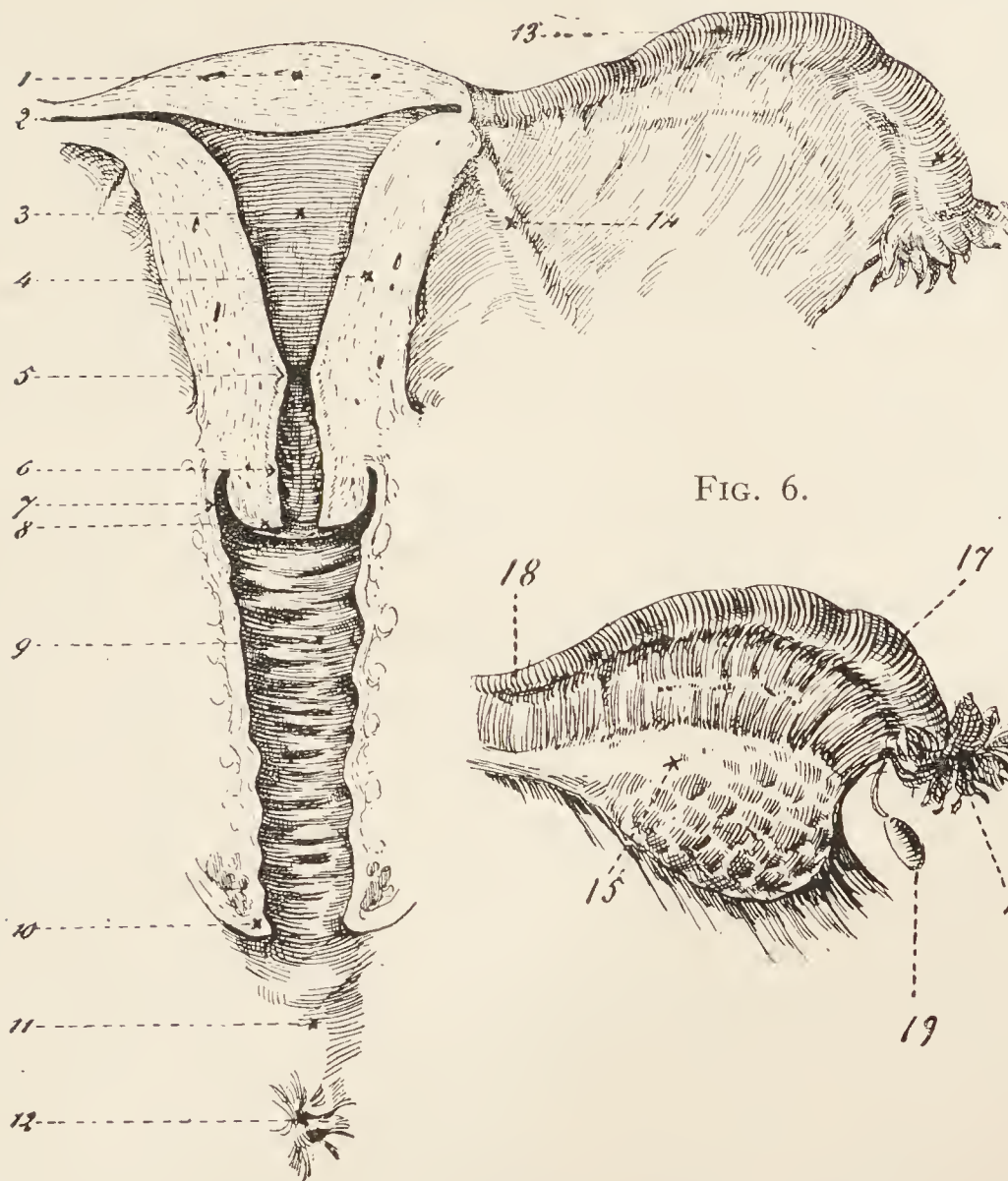


FIG. 5.—UTERUS—VAGINA—FALLOPIAN TUBE.

- |                                       |                     |
|---------------------------------------|---------------------|
| 1. Fundus.                            | 8. External os.     |
| 2. Uterine orifice of Fallopian tube. | 9. Vagina.          |
| 3. Cavity of the uterus.              | 10. Vulva.          |
| 4. Uterine wall.                      | 11. Perineum.       |
| 5. Internal os.                       | 12. Anus.           |
| 6. Cervical canal.                    | 13. Fallopian tube. |
| 7. Lateral fornix.                    | 14. Round ligament. |

FIG. 6.

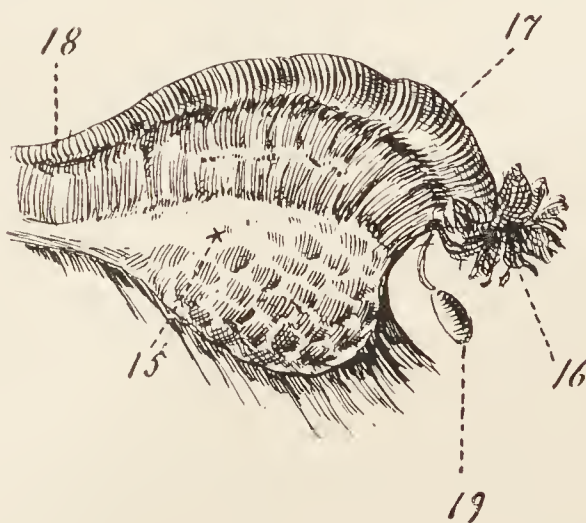


FIG. 6.—OVARY—FALLOPIAN TUBE.

- |   |  |
|---|--|
| 15. Ovary.                                | 17. Ampullary end of the Fallopian tube. |
| 16. Fimbriated end of the Fallopian tube. | 18. Isthmus of the Fallopian tube.       |
|   | 19. Hydatid of Morgagni.                 |

Starting from below, its direction points upwards and towards the back of the patient. This is an important fact for the nurse to remember when passing the vaginal douche-nozzle. Starting from above, the direction is downwards and forwards. This also is an important point for the midwife to remember, as it indicates in which direction the uterus should be pushed by abdominal pressure when she is expressing the placenta, in the third stage of labour, after it has separated and has descended into the vagina. Many a midwife thinks that the placenta is adherent, because it does not escape when she pushes the uterus downwards and backwards, i.e. in the wrong direction.

The posterior wall of the vagina measures  $3\frac{1}{2}$  inches, its anterior wall 1 inch less. Its relation to the structures in its neighbourhood are very important from a nursing point of view. At its lower end is situated the hymen, and projecting into its upper end is the neck of the uterus to which the vagina is attached. In front the urethra is closely united to the lower  $1\frac{1}{2}$  inches of the vagina, and the base of the bladder is more loosely attached to its upper 1 inch.

Behind, the lower 1 inch of the vagina is attached to the perineal body, its upper 1 inch lies next to the lowest part of the peritoneal cavity which is known as the *pouch of Douglas*, and the intermediate  $1\frac{1}{2}$  inches is in relation with the rectum. At the lower end of the vagina there is a thin band of voluntary muscle, known as the sphincter vaginæ. Rarely, this muscle is so sensitive that when touched it spasmodically contracts, thus preventing a vaginal examination or, as the case may be, causing pain and difficulty in coitus (dyspareunia). In the latter circumstance this band may have to be divided.

It has already been mentioned that the upper inch of the posterior wall of the vagina is in relation with the peritoneal cavity, and it is convenient to note here that a portion of the rectum,  $2\frac{1}{2}$  inches from the anus, also has a similar relation. It is most important that nurses should remember these facts, because there is a danger that a douche-nozzle or enema-nozzle may, by gross carelessness, be forced through the wall of the vagina or rectum and, the enema or douche-solution being injected into the peritoneal cavity, death results. This catastrophe has happened more than once.



Another disaster, due to gross carelessness, may usefully be mentioned here, although it has no gynæcological bearing. Nurses have been known, when giving an enema, to neglect to fix the india-rubber end-piece to the bone-nozzle. On occasions the end of the bone-nozzle, during its insertion, has been forced through the rectum and the enema injected into the cellular tissue round the rectum, causing abscesses in the surrounding tissues from the results of which patients have died.

**Uterus.**—The uterus, which measures 3 inches long, 2 inches broad and is  $\frac{1}{2}$  inch thick, is a muscular tube covered on the outside by a shiny membrane known as peritoneum and lined internally by mucous membrane, which is continuous with the mucous membrane lining the Fallopian tubes. The uterus is supplied with blood by four large vessels known as the right and left ovarian and uterine arteries, which are accompanied by their corresponding veins (see page 33). These arteries in their course along the sides of the uterus are coiled, and thus when this organ increases in length during pregnancy, they can become uncoiled, and so lengthen with it. The smaller arteries passing into the substance of the uterus are also coiled, but these coils remain, so that when the uterus contracts and retracts, after the birth of the child, the coils are approximated, which diminishes the amount of blood entering the uterus from the arteries.

The uterus also has lymphatic vessels and a complex nerve supply. The mucous membrane is termed the endometrium, and consists mostly of gland-tissue which secretes a fluid, that from the endometrium lining the body being clear and like water, and that from the endometrium lining the neck being glairy like unboiled white of egg.

It may be mentioned here that when a woman becomes pregnant certain changes take place in the endometrium which is then given the name of *decidua* because, like the leaves of a deciduous tree, it is cast off (mostly) during the third stage of labour and the first few days of the lying-in period. The uterus is pear-shaped, and in order that its functions may be more properly understood, is always described as consisting of two parts, the upper, called the corpus or body, and the lower, the cervix or neck.



*Corpus* (BODY).—The body of the uterus is the expanded portion of that organ. The uterine cavity is triangular in shape with the base uppermost, and has opening into it three canals, the two Fallopian tubes at its upper and outer angles, and the cervical canal at its apex. Its cavity, the walls of which are practically in contact, measures  $1\frac{1}{2}$  inches in length in the virgin, and in women who have borne children the cavity is somewhat longer.

That portion of the body of the uterus above the level of the Fallopian tubes is known as the *fundus*.

*Cervix* (NECK).—The cervix lies partly in the abdominal cavity and partly in the vaginal canal. The cervical canal is 1 inch long and is cylindrical in shape. The lower end of this canal opens into the vagina at the external os, its upper end into the cavity of the uterus at the internal os.

The uterus leans somewhat forward on itself, so that while the fundus looks forwards the neck looks downwards and backwards, that is, the uterus normally occupies a position of anteversion (turned forwards).

The body of the uterus may, in certain circumstances, be bent forwards (anteflexion) or bent backwards (retroflexion), or the body of the uterus may be turned backwards and its cervix turned forwards (retroversion) or the whole uterus may assume a lower position than normal (prolapse). Moreover, one or more of these malpositions may be combined.

*Relations of the Uterus*.—In front is the bladder; behind are coils of intestine in the pouch of Douglas, and the rectum; at the sides are the broad ligaments, Fallopian tubes and ovaries; above intestine and below the vagina.

The uterus is kept in its normal position by certain ligaments, the pelvic floor, and the intra-abdominal pressure.

*Ligaments*.—There are ten ligaments. Four in front known as the two *utero-vesical* and two *round ligaments* which pass between the body of the uterus and bladder and abdominal wall respectively; four at the sides, the two *broad ligaments* and the two *transverse cervical ligaments*. The broad ligaments are reflected from the sides of the body of the uterus, and from the abdominal portion of the cervix, to the pelvic wall in the neighbourhood of the sacro-iliac joints. The transverse cervical ligaments pass between the

spine of the ischium on each side to the abdominal portion of the cervix and upper part of the vagina. The two ligaments at the back stretch between the body of the uterus and sacrum, and are called the *utero-sacral ligaments*.

These ligaments, except the transverse cervical ligaments, consist of folds of peritoneum enclosing unstriated muscle and fibrous tissue. The transverse cervical ligaments are composed of fibrous tissue. The ligaments of the uterus may, roughly, be compared to the halyards which keep the mast of a ship in position, and if they are stretched they will facilitate a malposition of the uterus.

The broad ligaments, being attached to the sides of the uterus and pelvis, keep the uterus in its central position. The round ligaments are attached to the uterus just under the insertion of the Fallopian tubes, and the utero-sacral ligaments are attached to the uterus at the level of the internal os. Thus by the aid of the former the body of the uterus is pulled forwards, and of the latter the cervix is pulled backwards, and so these ligaments help to keep the uterus anteverted; if the uterus is retroverted, therefore, its position may be rectified by an operation termed "shortening of the round ligaments."

The uterus, however, is not rigidly fixed by these ligaments, but is able to swing backwards and forwards according to the amount of urine in the bladder. The transverse cervical ligaments help to prevent the uterus from slipping down.

*Pelvic Floor*.—The position of the uterus is also maintained by its attachment to the pelvic floor, which consists of peritoneum, fascia, certain muscles, of which the levatores ani are the most important, connective tissue, blood-vessels, nerves and perineal body. This attachment may be, roughly, compared to the relation between the mast of a ship and its deck into which it is partly fastened. If the pelvic floor is stretched or torn, the uterus will obviously be less securely supported and will thus tend to slip down, or prolapse as it is called.

*Intra-Abdominal Pressure*.—The intra-abdominal pressure acts through the intestines on the back of the uterus, and so helps to keep this organ in its normal position of anteversion. If the uterus has been pushed backwards by a very full bladder

(partial retroversion), and the woman suddenly strains, the intra-abdominal pressure will be applied to the front of the uterus, and forcing this organ still farther back may cause acute retroversion.

**Fallopian Tubes.**—The Fallopian tubes, named after the anatomist Fallopius, are two hollow structures composed mostly of muscle, lined with ciliated mucous membrane, and covered with peritoneum except on their lower surfaces, which lie between the upper layers of the broad ligament. The Fallopian tubes are supplied with blood-vessels, nerves and lymphatics, and are attached to the upper part of the uterine body, one on each side, and arch over to the corresponding ovary. Each tube is 4 inches long, and its outer part is called the *ampulla*, its free end being fringed or finger-like, and known as the *fimbriated extremity*. That portion which penetrates the wall of the uterus is called the *interstitial part*. It is very important to remember that since the fimbriated extremity opens into the peritoneal cavity, there is, in woman, a direct channel from the vulval orifice to the peritoneal cavity, and it is by means of this channel (vagina, cavity of the uterus and Fallopian tubes) that micro-organisms (septic and gonorrhœal) can reach the peritoneal cavity, setting up peritonitis, and causing perhaps death or lifelong invalidism. On the contrary, in man, there is not a direct channel opening into the peritoneal cavity. The results, therefore, of an attack of gonorrhœa in man are not likely to be nearly so serious, and gonorrhœa is very seldom directly responsible for his death, as it may be in a woman.

**Ovaries.**—The ovaries are two solid bodies  $\frac{3}{4}$  inches long, 1 inch broad and  $\frac{1}{2}$  inch thick, being the shape of an unshelled almond, and they project into the pelvic cavity. Each ovary is supported beneath the Fallopian tube by a fold of peritoneum, is attached to the uterus by a small ligament and is supplied with blood-vessels, lymphatics and nerves.

The ovaries, which are closely associated with the phenomena of puberty, menstruation and the menopause, are the structures in which the ova develop and from which they are discharged. Along with the thyroid, pituitary, adrenal, thymus and pineal glands, the ovary is classified as an endocrine gland,



inasmuch as its secretions, instead of passing out of the body by means of a duct, are absorbed into the blood.

These secretions (see p. 27) control menstruation and gestation, are responsible for the development of the other sexual organs at and after puberty, maintain the sexual organs in a state of functional activity, influence the general metabolism of the body in certain definite directions, and depend for their perfect action on the secretion of the thyroid and pituitary glands.

When such secretions are arrested, either as a result of ovarian atrophy through age, of disease, or of removal of the ovaries by operation, certain changes take place in the female which are collectively known as the menopause, or "change of life," and which will be dealt with under this heading.

### The Breasts.

The essential part of each breast, when this organ is fully developed, consists of about eighteen lobules which are pyramidal in shape, their apices pointing towards the nipples. These lobules are composed of innumerable small cavities called alveoli which are lined with a secreting epithelium. In other words, the breast is a large gland which secretes a fluid peculiar to itself, the milk. Leading from each alveolus is a small tube, and these tubes gradually join up until there remains one main tube leading from each lobule. This tube, which is called the *lactiferous duct*, opens on to the nipple. The nipple is covered with skin and is composed partly of muscle fibres, some of which by their contraction help to empty the lactiferous duct, while others, when the child is not sucking, act as a sphincter, and so prevent the escape of milk. These alveoli secrete a fluid during pregnancy which is not milk, and rarely a secretion can be squeezed from the breast when the woman thinks she is pregnant but is not (pseudocyesis), or if she has an ovarian or fibroid tumour.

### Urinary Organs.

**Kidneys.**—The kidneys are two glandular organs, situated one in each loin. Each kidney is about 4 inches long,  $2\frac{1}{2}$  inches wide, 1 inch thick, and weighs 4 to 5 ounces. The



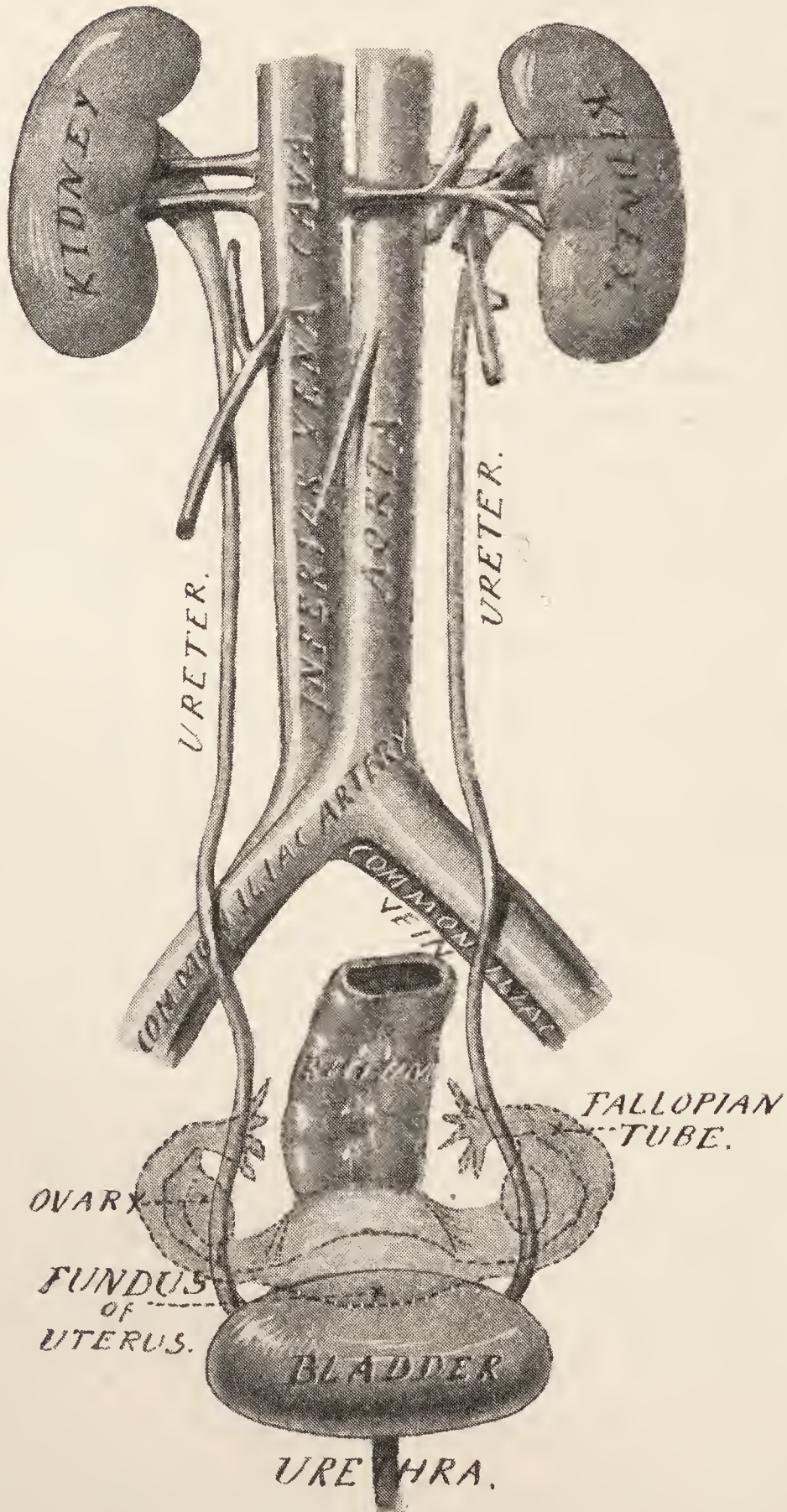


FIG. 7.—URINARY ORGANS.

The relations of the urinary organs to structures in their immediate neighbourhood. The fundus of the uterus, the ovaries, and the Fallopian tubes are dotted in, in outline.

kidneys are very plentifully supplied with blood-vessels, and are able, when healthy, to extract from the blood, as it passes through them, water and certain waste products which are harmful if retained in the circulation, and which, passing from the pelves of the kidneys, down the ureters into the bladder, together form the urine.

If the kidneys are diseased their action may be seriously hampered, or even arrested, the latter complication being called *suppression* of urine.

**Ureters.**—The ureters are two muscular tubes 14 inches long, and are situated one on each side of the body. They connect the pelvis of the kidney with the bladder, conveying the urine from the kidneys to the bladder. The ureters are lined with mucous membrane and are supplied with blood-vessels, lymphatics and nerves.

**Urethra.**—The urethra, which is a muscular tube,  $1\frac{1}{2}$  inches long, is lined with mucous membrane and is supplied with blood-vessels, lymphatics and nerves. Its lower  $1\frac{1}{2}$  inches are in close contact with the anterior vaginal wall. Internally the urethra opens into the bladder, externally on to the vestibule, and it is the canal through which the urine is expelled from the bladder.

**Bladder.**—The bladder is a muscular organ lined with mucous membrane and is supplied with blood-vessels, lymphatics and nerves. It lies in front of the uterus, behind the pubic bones and above and in front of the upper part of the anterior vaginal wall. It forms a cistern for the urine which is being continually secreted by the kidneys, until sufficient has accumulated to induce the desire for micturition. As the urine accumulates, the bladder, pushing the uterus somewhat backwards, eventually rises out of the pelvis, forming an elastic swelling just above the symphysis pubis. In the complication known as *retention* of urine, so great may be the amount of this fluid retained, the bladder forms a well-marked abdominal swelling rising at times as high as the umbilicus. The capacity of the bladder is very considerable, and over 10 pints of urine have been drawn off, by catheter, in cases of prolonged retention.

It will thus be seen that there is a channel, lined with mucous membrane, leading from the vestibule to the pelvis of the



kidney *via* the urethra, bladder and ureters. The presence of this channel will indicate to the nurse how very careful she must be to swab efficiently the vulva and vestibule, and to sterilize the catheter before passing this instrument. The passage of a catheter without such precautions may lead to infection of the mucous membrane of the urethra (urethritis), of the bladder (cystitis), and of the ureter (ureteritis). Such inflammation spreading up to the pelvis of the kidney and thence to its substance may be the cause of the death of the patient.

### The Rectum.

The rectum is a muscular tube lined with mucous membrane. Its blood-supply comprises hæmorrhoidal arteries and veins, and the latter when they become varicose form hæmorrhoids. It is also supplied with lymphatics and nerves. The rectum forms the terminal portion of the large intestine and measures, as a rule, 6 inches in length.

The last  $1\frac{1}{2}$  inches, below the tip of the coccyx, are bent back, the aperture of exit being called the anus. This orifice is kept closed by a strong sphincter muscle. In front of the lower part of the rectum is the perineal body. The middle part is in relation with the posterior wall of the vagina, and the upper part with that portion of the peritoneal cavity known as the pouch of Douglas.

The rectum acts as a temporary reservoir in which the fæces should accumulate, for a short time, prior to their expulsion from the body. Owing, however, to careless habits the fæces are often retained in this portion of the intestinal canal far longer than they should be.

## PART II.

### PHYSIOLOGY.

#### CHAPTER II.

To understand the phenomenon of conception it is necessary briefly to describe the physiology of the female genital organs, namely, puberty, ovulation, menstruation and the menopause.

**Puberty.**—Puberty, indicated by the outward sign of menstruation, marks the time when the ovaries and uterus first become active, and indicates the commencement of the child-bearing period of the female. The age at which puberty occurs depends upon racial characteristics. It has nothing to do with the longitude and latitude in which the girl lives, but is generally earlier in warm climates than in cold. In this country the average age is fourteen.

The importance of the influence exerted by the ovaries on the development of the female is shown by the marked change in her behaviour and temperament at puberty; she becomes quieter, retiring, and probably bashful. The external appearance also of the girl changes, so that her shape now commences to approach that of a woman; her breasts become developed; the axillæ, the mons veneris and labia majora are gradually covered with hair; the hips broaden, and the buttocks increase in size, while ovulation and menstruation commence.

It is interesting to note that at puberty enlargement of the thyroid and pituitary glands takes place, and that when the ovaries cease to act the menopause occurs.

**Ovulation.**—The process by which an ovum becomes ripe and is then discharged is known as ovulation. The ovary is covered by a single layer of cells called the *germ*



*epithelium*. During foetal life small processes of this germ epithelium, known as the egg-tubes of Pflüger, grow down into the substance of the ovary. These processes are, in due course, cut across, by other cells of the ovary, into minute portions, known as egg-nests. Certain changes take place in these egg-nests, and they become converted into *primordial follicles*. It is calculated that, when a female child is born, there are not less than 10,000 of these primordial follicles in her ovaries.

Primordial follicles are not formed after the birth of the child.

The majority of these primordial follicles do not further develop but at, and after, puberty in certain of them a change occurs and this change is known as maturation. In other words, these primordial follicles become ripe, and the resulting collection of cells is then known as a *Graafian follicle*, after von Graaf, who first described it.

**Maturation.**—The process of maturation is as follows : one of the cells of a primordial follicle becomes much larger than the remainder and is then known as the ovum, egg cell or *oocyte*. The remaining cells arrange themselves round the oocyte and form the structure known as the *membrana granulosa*. This *membrana granulosa* proliferates, forming many layers, and then many of the cells of this layer become converted into fluid, with the result that a Graafian follicle is formed.

A Graafian follicle, therefore, consists of a cavity lined by cells of the *membrana granulosa* which have not liquefied ; enclosed in them at one spot is the oocyte and the cavity is filled with fluid.

In the final stages of maturation, as the amount of fluid increases, the ovarian substance between the Graafian follicle and surface of the ovary undergoes pressure necrosis. The tension in the Graafian follicle then becomes so great that the fluid bursts through the outer covering of the ovary, carrying with it the oocyte, which has become detached. The oocyte is then either grasped by the fimbriæ of the Fallopian tube or drops into the peritoneal cavity and perishes. In the former case the oocyte is propelled along the Fallopian tube by the cilia into the cavity of the uterus, from whence, if unfertilized, it is discharged. If, however, the oocyte becomes fertilized

in the Fallopian tube it is known as the *zygote*. The *zygote* then starts to develop, and on its arrival at the cavity of the uterus it is known as the *blastocyst* (see p. 32).

When the oocyte and fluid have escaped from the Graafian follicle the membrana granulosa is thrown into folds. Moreover, the relief of tension in the Graafian follicle, due to the escape of the fluid, causes certain small blood-vessels surrounding the Graafian follicle to rupture. This blood escapes into the potential cavity remaining and coagulates. The cells of the membrana granulosa, which contain a yellow pigment, then grow into the coagulated blood and the structure is termed the *corpus luteum*. If the oocyte is not fertilized the corpus luteum after about two weeks commences to atrophy and practically disappears a few weeks later.

If, however, the oocyte is fertilized, the corpus luteum continues to grow for twelve weeks, and then persists throughout pregnancy, gradually disappearing after the birth of the child.

Ovulation continues between puberty and the menopause, unless the woman becomes pregnant, when it ceases. Ovulation also, as a rule, ceases when the mother is nursing her child, but not always, and certainly not if she nurses it beyond the proper time, a custom which is not uncommon among some women and which is often pursued with the false idea that it prevents impregnation.

It is calculated that during the sexual life of a female a Graafian follicle ripens every four weeks.

**Menstruation.**—The period concerned with the physiological activity of the reproductive system in mammals, other than human beings, is called the *sexual season*. During this period a series of phenomena occur called *œstrous cycles* (recurring stimulations).

Each cycle is divided into four phases :—

1. A period during which the Graafian follicle is ripening (pro-œstrum).
2. A period of sexual excitement (heat) when the Graafian follicle ruptures (œstrum).
3. A period of pregnancy (met-œstrum), if the ovum becomes fertilized.
4. A period of sexual rest, during which the Graafian



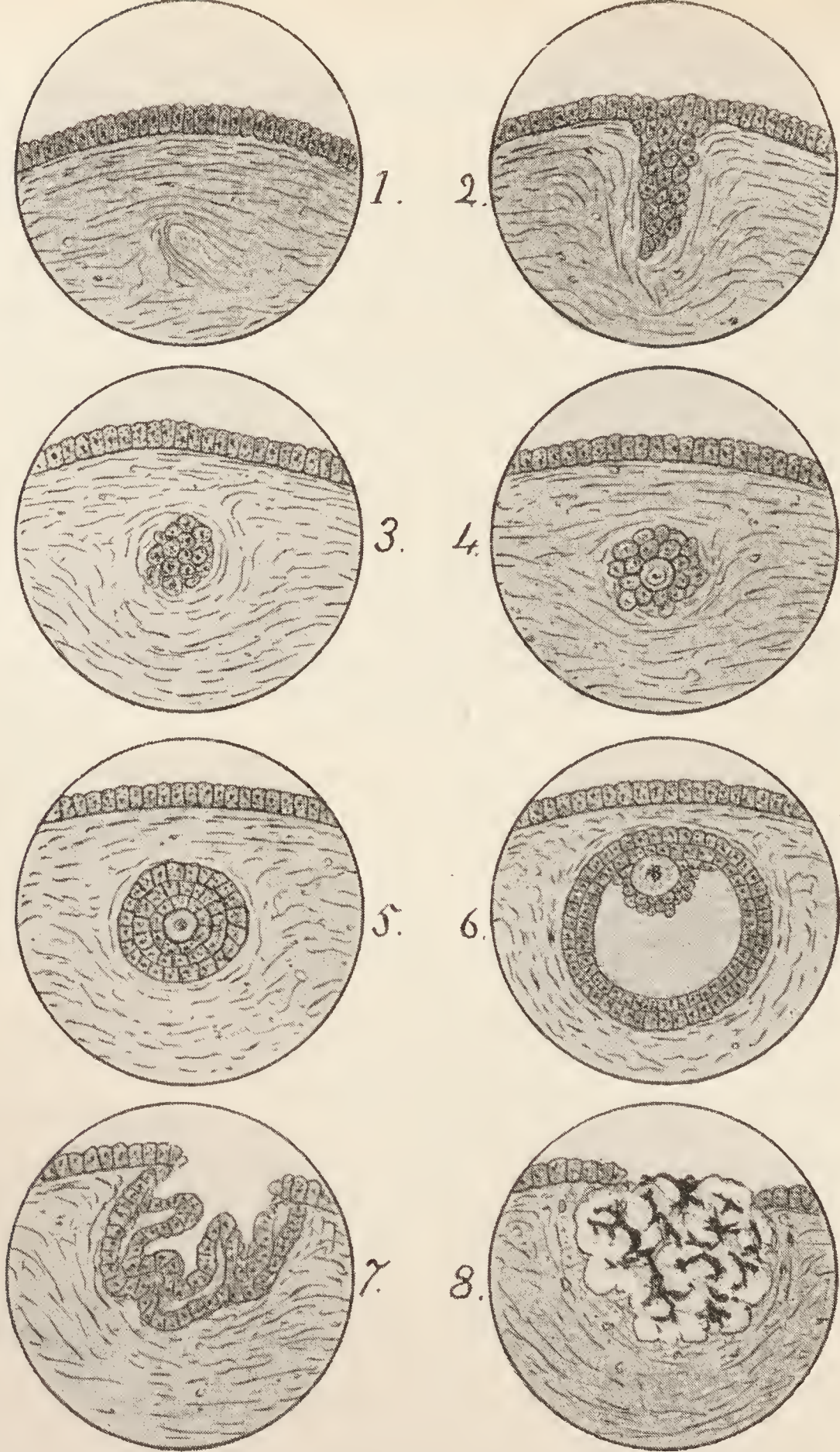


FIG. 8.—Diagrammatic representation of ovulation and maturation in a section of the ovary. 1. Germ epithelium covering the surface of the ovary. 2. Pflüger's egg-tube growing down into the ovarian substance. 3. Primordial follicle. 4. Formation of oocyte by one cell increasing in size. 5. Membrana granulosa formed round oocyte. 6. Graafian follicle, some cells of 5 being converted into fluid. 7. Collapsed membrana granulosa. 8. Corpus luteum.



follicles do not ripen and menstruation occurs (anœstrum) if the ovum does not become fertilized.

Remarkable variations occur in different species both in the length of these four phases and in the number of œstrous cycles in each sexual season. Moreover, breeding by artificial selection and in an abnormal environment introduce varieties into the sexual cycles of most mammals.

**Human Female.**—Attempts have been made, by some authors, to correlate the “monthly” cycles of human females with the above classification. Difficulty, however, arises from the fact that in the human female there is no specified period for the approach of the male, and moreover, in the human species, apparently, two of the œstrous cycles have been “telescoped into one.”

It has been shown, however, that ovulation in the human female occurs about the twelfth to the seventeenth day after menstruation (œstrus) and that from the sixth day the Graafian follicles are ripening (pro-œstrum). The time from the cessation of menstruation to the sixth day may, therefore, be termed that of sexual rest (anœstrum).

Menstruation, which is the outward sign of the sexual cycle in woman is, therefore, an indication that the oocyte has not been fertilized.

Menstruation has been termed “the abortion of an unfertilized egg.” Every month, when the woman is not pregnant, from the end of the menstrual flow up to the tenth day the endometrium is in a resting stage. Thereafter, marked changes occur in the endometrium, consisting principally of a hypertrophy so that it resembles in many particulars the decidua of pregnancy, to prepare it for a fertilized egg. If a fertilized egg does not arrive, the superficial layer of the endometrium degenerates and is cast off with the next menstrual flow. This degeneration coincides with the degeneration of the corpus luteum.

Menstruation which is initiated in the ovary and controlled by hormones from other ductless glands (see Hormones) is characterized by a periodic discharge of blood and mucous from the endometrium lining the body of the uterus together with the superficial portion of this membrane. It commences with puberty and continues, normally, to the menopause.

In addition certain constitutional and other symptoms, such as depression, tiredness, headache, irritability, backache, tenderness of the breasts and nausea, mark its incidence in some women. The "period," "the flow," "the courses," or "being unwell," as it is variously termed, recurs, as a rule, once a month and generally 28 days from the commencement of the previous period, till the woman is between 45 to 50 years of age, except during pregnancy, and in most females during lactation. Individuals may, however, present considerable variation from this and yet be perfectly healthy; thus some healthy women menstruate regularly every three weeks, and others every five.

In most instances the flow lasts from three to six days. During this time it is not so very uncommon for the flow to cease for a day. The quantity of blood lost, which varies widely in different women, is on an average 5 ounces; but when the doctor, or nurse, has to consider whether the period is excessive or otherwise, the amount the patient generally loses must be ascertained and a comparison made with an estimate of the quantity she now loses, since some women in perfect health regularly lose an amount that in others would be considered quite excessive. Since, except in unusual instances, it is not customary when arriving at a decision to ascertain the weight of the used diapers in comparison with their weight before use, some other method has to be relied upon to ascertain whether a woman is losing more than her normal amount at the periods. As a rule it may be taken that an average woman, of cleanly habits, uses about 8 to 10 diapers during her period. Any marked increase, therefore, in the number of diapers a woman is accustomed to use, and the presence of clots, especially if a fair amount of such are expelled during micturition and defæcation, is an indication that the period is excessive.

Normally the discharge is dark red, and the blood contained therein is not clotted. The reason the blood does not clot (Blair Bell) is because the uterine mucous membrane prevents the passage of fibrin ferment. In certain conditions, however, when the loss is excessive, fibrin ferment is allowed to escape from the blood and clots are then formed, and the colour of the discharge is bright red.

Beckwith Whitehouse, on the other hand, contends that there is always a small clot, at menstruation, in the uterus, and that it is the liquefaction of this which produces the menstrual blood. Menstruation ceases if the ovaries are not functioning. Thus if the woman is pregnant, if the ovaries are totally destroyed by disease, if these organs are removed, or if the general state of the patient's health is unsatisfactory, perhaps due to some abnormal working of the ductless glands, she will not menstruate.

The fertilized ovum does not completely fill the cavity of the uterus till the end of the third month. Up to this time, therefore, there is a cavity which is lined with the decidua (the name given to the endometrium when altered by pregnancy). In some pregnant women small blood-vessels in this decidua may rupture at the time when menstruation would occur; there is, in consequence, some bleeding, and this has erroneously been termed menstruation. In such circumstances there may be a loss for the first three months, but most commonly only for the first. There being no cavity after the third month from the lining of which the blood could flow, any loss after this must be due to separation in part of the decidua (threatened miscarriage), as, in most cases, is any loss during the first three months. Miscarriage is more likely to occur at the time the period would have come on if the woman had not been pregnant, since there is then an increased congestion of the pelvic organs.

There is no truth in the common superstition that it is dangerous for a woman to take a bath during menstruation. On the contrary, it would be much better if all women did so. Excessive exercise during menstruation is not advisable, but unless the loss is profuse, it is a mistake for a girl, or woman, to allow this function to interfere with her ordinary activities.

**The Menopause, Climacteric, or "Change of Life"** takes place in the majority of women between the ages of forty-five and fifty, though it may occur earlier or later than this.

Rarely at the menopause, menstruation, which has been quite regular up till then, fails to come on at the usual time, and never again appears. More commonly, menstruation is altered both in its regularity and amount: the intervals



between the periods may become longer, so that several weeks or months may elapse before the appearance of the next and, perhaps, last period; on the other hand, the frequency may be increased, so that the periods, for a short time, appear more than once a month. The same irregularity is noticed in the amount lost. In some women the quantity becomes progressively less, in others there may be one or more profuse losses, or, again, after missing several periods the woman may have a final and profuse loss.

Accompanying the menopause certain symptoms of a well-recognized character supervene. The woman complains of hot flushes or cold sensations, nausea, sickness, dyspepsia, constipation, headache, giddiness, irritability, neuralgia, backache, or pains in various parts of the body; she may become stouter, and there is a disinclination for exercise. She may also suffer mentally so that she loses her memory, takes to drink to drown her worries, steals articles from shops, accuses her husband of no longer caring for her, or of being unfaithful. The mental depression is at times so great that she talks of committing suicide and on rare occasions does so.

The menopause is a dangerous time of a woman's life, not because the cessation of menstruation accompanying it is of itself inimical to good health or is the cause of any disease, but because it is about this time that cancer of the uterus most commonly occurs. Also, since in many women the menopause often supervenes with some irregularity of menstruation, *any increase in the frequency or loss of menstruation about this time is apt to be attributed by the woman, her friends, nurses, or even by her medical attendant to the "change of life," when in reality it may be due to cancer, the early recognition of which might have been the means of saving her life.*

It is, therefore, a safe rule to disregard the fact that at the menopause the periods may become more frequent and profuse, without there being any discoverable cause, *and to advise any woman who is complaining of these symptoms to seek medical advice, and to insist on being examined internally.*

In certain women the menopause appears much earlier than it should. In some patients no cause for this can be determined; others will give a history of a severe illness,

or shock to the nervous system and, occasionally, after the birth of a child the menopause supervenes.

### Hormones.

Under this heading we are concerned, in this book, principally with the Female Sex Hormones. In order, however, to appreciate their action, it will be of advantage to make a few very elementary observations on hormones in general.

The word hormone is derived from the Greek *ὁρμαω*, which means "to excite," "to urge on" or "to set in motion." Hormone was the name given by W. B. Hardy to the secretions of certain glandular organs, in the sense that these secretions are chemical messengers. That is to say, these glandular organs send messages to other parts of the body inciting them to perform certain functions. The *rôle* of hormones in the life-history of the body is, in many cases, a very difficult one to grasp, except by bio-chemists who have special knowledge of the subject, and not always by them. Although in the case of some of the endocrinal glands the specific action of the hormones they secrete has been identified, nevertheless, whether there is a secretion of hormones by the remaining glandular organs is merely, at the present time, a matter of surmise although it is presumed that there is, but they have not been identified.

It is obvious, from common observation, that the growth and well-being of the body requires the correct action and interaction of its various glandular organs. In other words, normal health depends on a sufficient supply of the secretions and excretions of the glandular organs, an increase or decrease in the action of these glands leading to ill-health. The glandular organs of the body may be divided into two groups, those having ducts and those without, in the latter case the secretions being carried to various parts of the body by the veins and lymphatics.

**Glandular Organs with Ducts.**—Intestine, kidney, lachrymal, liver, mamma, pancreas, salivary, sebaceous, stomach, sweat and uterus.

**Glandular Organs without Ducts.**—Ovary, parathyroid, pineal, pituitary, prostate, spleen, supra-renal, testis, thymus, thyroid and corpus luteum.

Moreover, while some of these glands are concerned with secretion or excretion only, others, such as the liver, are both secretory and excretory. Schafer gave the name "Endocrinal glands" to those glandular organs the secretion of which is able to excite, or in any way alter, the preservation of normal health.

The known facts regarding the action of hormones have been elicited by a consideration of the results following the ablation of certain of these organs (operative, experimental); by transplantation of these organs (operative, experimental); by bio-chemical and chemical analyses; by bio-chemical exhibition and by the investigation of diseases resulting from hypertrophy or atrophy of these organs.

The number of hormones secreted by any one endocrine gland varies. In some, for instance, one only, as in the case of the thyroid gland, while in others more than one, as in the case of the pituitary gland.

The various hormones which are known are given distinctive names, and certain diseases are now recognized to be due to an excess, or diminution, of the amount of hormones secreted by certain endocrinal glands.

### The Female Sex Hormones.

It is evident, from the results to the woman, following the removal of her ovaries, that these organs control some of the phenomena of sex activity, through the medium of their internal secretions. It is now known that the *corpus luteum* (see p. 21) is an endocrinal gland secreting a specific hormone which has been given the name *Progestin*, the action of which—

1. Prevents ripening of the Graafian follicles, and so ovulation.
2. Prevents the incidence of œstrus (heat).
3. Prevents the incidence of menstruation.
4. Favours the growth of the decidua.
5. Favours the embedding of the fertilized ovum.
6. Favours the growth of the fertilized ovum in the uterus.
7. Prevents the uterus from contracting strongly, as it does in labour or miscarriage.
8. Maintains mammary activity in pregnancy.

These facts were discovered by experiments on mice and guinea-pigs, among other animals. Thus if the corpus luteum of a mouse is removed during the first half of pregnancy,



this animal immediately aborts. Since progesterin is secreted for some little time after childbirth, this hormone should be a hindrance, at anyrate, to the woman again becoming pregnant in the early months of lactation, and this fact is a matter of common observation. Again, it has been found that the removal of the corpus luteum from the ovary of the human female, after rupture of the Graafian follicle, is followed in from 36 to 48 hours by menstruation, 10 days before it is due. As a result of these experiments, and others, it seemed obvious that while a sufficient amount of progesterin is being secreted, it must be neutralizing the action of some other secretion, since the ripening of any more Graafian follicles, the appearance of œstrus and the incidence of menstruation are arrested. This hormone was discovered and was given the name of *œstrin*, and this secretion is derived from the germinal cells of the ovaries.

It will thus be seen that the action of *œstrin* is exactly the opposite to that of progesterin in that the former—

1. Induces œstrus.
2. Incites menstruation.
3. Stimulates the Graafian follicles to ripen, ovulation.

Lastly, there is an interdependence between the various endocrinal glands, so that a correct balance is kept between the amount of their hormones secreted and the requirements of the healthy body. This interdependence is well exemplified in the case of the thyroid gland and the ovaries. There being a greater demand on the metabolism of the woman at puberty, during menstruation and throughout pregnancy, phenomena in which the ovaries play a leading part, the thyroid at these times enlarges, whereas at the cessation of menstruation and ovulation (menopause) the thyroid gland becomes smaller.

Another example of this interdependence is the pituitary gland, which is known to have four hormones. From the anterior lobe of the pituitary is secreted *Prolan A*, which assists the *œstrin* to ripen the Graafian follicles, and *Prolan B*, which assists the *œstrin* to form the corpora lutea. From the posterior lobe *Pitocin*, which diminishes the activity of progesterin, so that active contractions of the uterus supervene only at term or a miscarriage, and *Pitressin* which acts on the remaining plain muscle of the body.

### The Known Hormones and their Ill Effects.

| GLAND.               | HORMONE.               | SECRETION TOO MUCH.  | SECRETION TOO LITTLE.  |
|----------------------|------------------------|--|--|
| PANCREAS.            | Insulin.               | Hyperinsulinism, with attacks of sweating, faintness and headache. | Diabetes.<br>Pancreatic infantilism.   |
| PARATHYROID.         | Parathormone.          | Generalized osteitis fibrosa.                                      | Tetany.  |
| PITUITARY.           | Prolan A.<br>Prolan B. | Acromegaly or Sexual precocity.<br>Gigantism.                      | Infantilism in child.<br>Dercum's disease in adult.<br>Obesity.<br>Diabetes insipidus. |
| THYMUS.              | —                      | Status lymphaticus.  | —  |
| THYROID.             | Thyroxin.              | Exophthalmic goitre.   | Myxœdema.<br>Cretinism.  |
| SUPRA-RENAL.         | Eucortone.             | Sexual precocity.<br>Hirsutism and virilism in women.              | Addison's disease.   |
| INTESTINE.           | —                      | —  | —  |
| KIDNEY.              | —                      | —  | Renal infantilism.   |
| MAMMA.               | —                      | —  | —  |
| PLACENTA.            | —                      | —  | —  |
| PROSTATE.            | —                      | —  | —  |
| SPLEEN.              | —                      | —  | —  |
| STOMACH.             | Anti-anæmic principle. | —  | Pernicious anæmia.   |
| TESTIS.              | —                      | Precocious puberty.  | Eunuchism.   |
| UTERUS.              | —                      | —  | —  |
| <i>Sex Symptoms.</i> |                        |  |  |
| THYROID.             | Thyroxin.              | Irregular uterine bleeding.  | Amenorrhœa.  |
| Ovary.               | Œstrin.<br>Progestin.  | —<br>—   | Amenorrhœa.<br>Sterility.<br>Climacteric symptoms.                                     |

## PART III.

### PREGNANCY.

#### CHAPTER III.

##### FERTILIZATION.

FERTILIZATION, or conception, consists in the union of a spermatozoon (male reproductive cell) with the oocyte (female reproductive cell). The spermatazoa, which are developed in the testicles, being deposited in the vagina, and by their own movements, aided probably by the suction of the uterus at the moment of their deposition, pass through the external os, along the cervical canal, through the internal os, up the uterine cavity, and into the Fallopian tube. One spermatozoon (and occasionally two) coming into contact with the oocyte penetrates it and thus fertilization results. Very rarely a spermatozoon will pass through the Fallopian tube into the peritoneal cavity and entering a burst Graafian follicle, before the oocyte has been discharged, fertilizes the oocyte *in situ*, giving rise to the condition known as an *ovarian pregnancy*.

It has been proved by observation that, in female mammals other than human, the oocyte is fertilized in the Fallopian tube. The not uncommon complication of *tubal gestation* is a proof that the same obtains in the human female. Although many women become pregnant with every opportunity, it is interesting to realize that it must be somewhat difficult for a woman to become pregnant, since there is only one oocyte to be fertilized, and to ensure this Nature has ordained that tens of thousands of spermatazoa, only one of which will be required, shall be deposited in the vagina at each coitus.



### The Developing Zygote.

As the zygote (fertilized oocyte) is propelled along the Fallopian tube it develops into a structure called a *blastocyst*. On reaching the cavity of the uterus the blastocyst commences to "eat" its way into the first portion of decidua it touches, which is somewhere in the neighbourhood of the top of the uterus. Since the placenta will eventually be formed at the site where the blastocyst is embedded, it is wise provision of Nature that this should take place in the upper segment of the uterus, otherwise, if the embedding took place in the lower segment, the placenta would be below the child and would obstruct its passage during labour. As a fact, for some reason which is unknown, the blastocyst does, on occasions, embed itself in the lower segment, giving rise, in due course, to a very dangerous complication of labour known as *unavoidable hæmorrhage*, due to the partial or complete separation of the placenta which is below the child, and which separation must take place before the child can be born.

### The Pregnant Uterus.

The physiological changes in the uterus induced by pregnancy will now be considered. Such changes are concerned with an increase in size of the uterus to enable its cavity to accommodate the growing foetus and afterbirth; changes in the endometrium to allow of the formation of the maternal portion of the placenta; hypertrophy of its muscle-coats to enable it to expel the child during labour and arrest bleeding after, and alterations in its blood supply to enable it to nourish the foetus. In addition the cervix is remarkably softened, its pink colour changes to one of purple; on listening over the uterus a blowing sound can be heard, known as the *uterine souffle*, and painless rhythmical contractions can be felt in the uterus from the 4th month onwards.

**Increase in the size of the Uterus.**—The increase in the size and weight of the uterus is due chiefly to the hypertrophy of its muscle, and a little to its increased blood supply. The uterine cavity, during pregnancy, increases in length

from  $2\frac{1}{2}$  inches to 12 inches, and in weight from 2 ounces to 2 pounds after the placenta has been expelled. The position of the top of the uterus at the different months of pregnancy is shown in the following table. It will be noticed

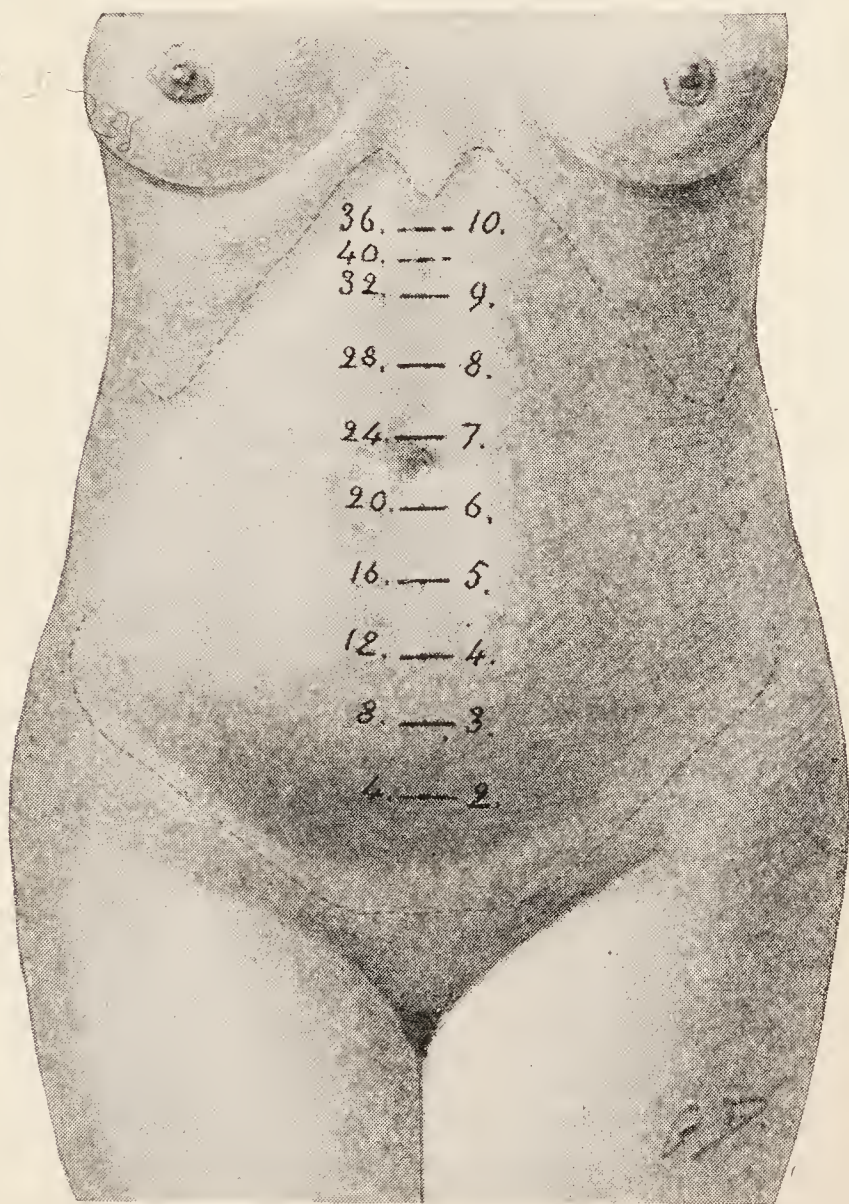


FIG. 9.—Showing the position of the top of the uterus at the different weeks of pregnancy.

that the fundus is just below the umbilicus at 20 weeks and just above at 24 weeks. These measurements are only approximate, since they vary somewhat according to the amount of fat in the abdominal wall and whether the woman is a primigravida or multipara (Fig. 9).



|            |                            |                                  |   |
|------------|----------------------------|----------------------------------|---|
| At 4 weeks | } the top of the uterus is | 2 in.                            | } above the level of the symphysis pubis. |
| „ 8 „      |                            | 3 „                              |   |
| „ 12 „     |                            | 4 „                              |   |
| „ 16 „     |                            | 5 „                              |   |
| „ 20 „     |                            | 6 „                              |   |
| „ 24 „     |                            | 7 „                              |   |
| „ 28 „     |                            | 8 „                              |   |
| „ 32 „     |                            | 9 „                              |   |
| „ 36 „     |                            | 10 „                             |   |
| „ 40 „     |                            | it has sunk two or three inches. |   |

**Changes in the Endometrium.**—The changes that take place in the endometrium as a result of fertilization are of a striking character, and the resulting membrane is called the *decidua*, because it is almost completely cast off at and after labour. Briefly the changes are as follows: The endometrium becomes very much thickened and softer, thus forming a bed in which the blastocyst rests in the early stages of its development. In this thickened decidua three distinct layers are formed. That nearest the uterine cavity is called the compact layer, and is composed of millions of small cells closely packed together, the object of which is to prevent the ovum escaping from its bed in the decidua, especially in its early stages. The layer attached to the muscle of the uterus is called the ampullary layer and it has the same structure as the normal endometrium. It is sometimes known as the “postage stamp” layer, because the lumina at the ends of the glands, being larger than the rest of the lumina, represent the perforations in a sheet of postage stamps and allow of the easy separation of the placenta at birth. The third or middle layer, which is known as the spongy layer, is that in which the intervillous spaces filled with maternal blood are formed, and into which the chorionic villi of the fœtus can dip, to extract nourishment from, and discharge waste products into, the blood of the mother.

The decidua lining the body of the uterus is variously named according to its position. Thus the portion which in time will become the maternal part of the placenta is known as the *decidua basalis*. That which separates the ovum from the cavity of the uterus is called the *decidua capsularis*, and the



remainder of the decidua lining the uterus is known as the *decidua vera*.

As the foetus increases in size, marked changes, as before mentioned, take place in the decidua basalis by which the maternal portion of the placenta is formed, while the decidua capsularis blending with the chorion of the foetus gradually becomes thinner, and, owing to this increase of size, it eventually becomes blended with the decidua vera, which itself becomes thinner.

**Hypertrophy of the Muscle Coats.**—It has already been stated that most of the increase in the weight, and part of the increase in the size, of the pregnant uterus is due to the hypertrophy of the muscle coats. During the growth of the uterus, the muscle in the lower part of its body does not hypertrophy to such an extent as that in the upper part; when labour supervenes the difference in the two parts becomes marked, and they are known respectively as the *upper* and *lower* uterine segments. These segments each play a very important rôle during labour. The lower segment in extent is that portion of the uterus which at term lies within 3 inches of the internal os. The upper segment is comprised in that portion of the uterus above this limit. The average thickness of the upper uterine segment at term is rather more than half an inch, while the lower segment is thinner. Three layers of muscle can be distinguished in the uterus after pregnancy is advanced. An outer layer which is longitudinal, the action of which is to express the child; an inner layer of interlacing fibres encircling the blood-vessels, the action of which is to prevent blood reaching the uterine sinuses after the placenta has been expelled, and a circular layer round the body and internal os, which keeps the cervical canal closed during pregnancy, assists in its dilatation at the commencement of labour and raises the intra-uterine pressure during labour.

**Alterations in the Blood Supply of the Uterus in Pregnancy.**—The ovarian and uterine arteries enlarge with the pregnant uterus and are able to stretch because they have the shape, more or less, of the blade of a corkscrew; the coils can thus become increasingly separated as the uterus lengthens. Those branches of the arteries, however, which perforate the muscle keep their coiled form and thus assist,

as will be seen later, in the prevention of post-partum hæmorrhage. The veins also become enlarged, especially in the region of the maternal portion of the placenta, where they form the *uterine sinuses*.

Lastly, the most important change is the formation of the *intervillous space* in the spongy layer of the placenta, into which the villi of the chorion dips. The formation of the intervillous space is difficult to understand and need not here be accurately described. Running through the decidua basalis are small thin-walled arteries and veins. When the chorionic villus (concerning which see later) bores its way into the decidua basalis, its outer covering eats into some of these vessels, and so allows maternal blood to escape into the spongy layer. The intervillous space is thus formed. The maternal blood, therefore, in the intervillous space is continually being changed for the benefit of the fœtus, bathing as it does the chorionic villi.

**Softening of the Cervix.**—This change in the consistence of the cervix is due to the œdema caused by the presence of the uterine contents on the veins of the cervix. It is an important sign of pregnancy. Towards the end of pregnancy the cervix becomes so soft that it is much more difficult to distinguish than in a woman not pregnant. The softening first appears during the second month of gestation.

**Blue Coloration of the Cervix.**—This alteration in colour appears at 12 weeks and is due to the venous congestion.

**Uterine Souffle.**—The uterine souffle is a blowing sound heard over the sides of the pregnant uterus. It is, as a rule, heard best over the left side and is thought to be due to the blood rushing through the uterine artery. In frequency it corresponds to the rate of the pulse of the mother.

**Uterine Contractions.**—Throughout pregnancy painless contractions are taking place in the uterus. These rhythmical contractions can easily be appreciated by placing the hand on the abdominal wall covering the uterus. At the 16th week the uterus can be felt quite easily through the abdominal wall, and it is at this time, therefore, that intermittent uterine contractions are first noticed. The intervals between the contractions vary, and may be as long as 20 minutes.



## The Zygote.

No one as yet has had the opportunity of examining the earliest stages of the development in the human zygote. There is reason to think that these stages do not differ from those which take place in the case of other mammals. On this assumption, therefore, we may take it that when the spermatozoon penetrates the human oocyte they both fuse

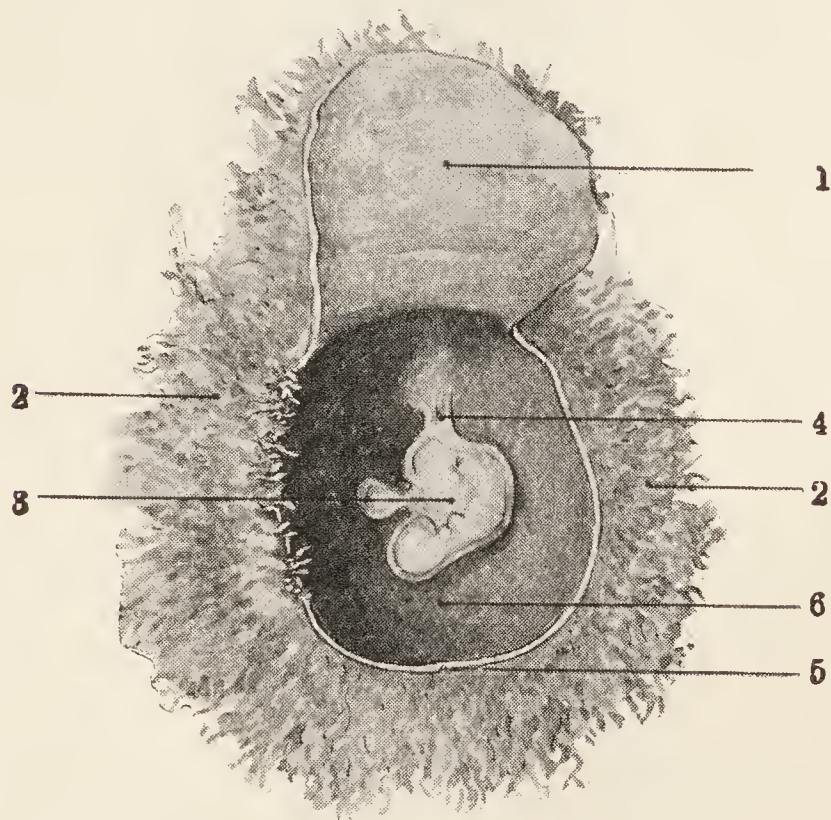


FIG. 10.—The developing blastocyst before the formation of the placenta. A flap has been raised so as to show the interior. 1. Flap raised; 2. Chorionic villi; 3. Embryo; 4. Umbilical cord; 5. Amnion; 6. Liquor amnii.

and the zygote is thus formed, consisting of one cell  $\frac{1}{100}$  of an inch in diameter. This cell at once divides into two, then into four, then into eight, and so on, with the result that very quickly the zygote has been replaced by a mass of cells which are numbered by the million. The further development of the zygote is difficult to understand and impossible adequately to describe in a book of this nature, neither for that matter is there any necessity.

Suffice it to say that some of these cells form a membrane



known as the *chorion* from which spring minute finger-like processes called *chorionic villi* (the fœtal placenta); others form a membrane known as the *amnion*, and the remainder form the embryo.

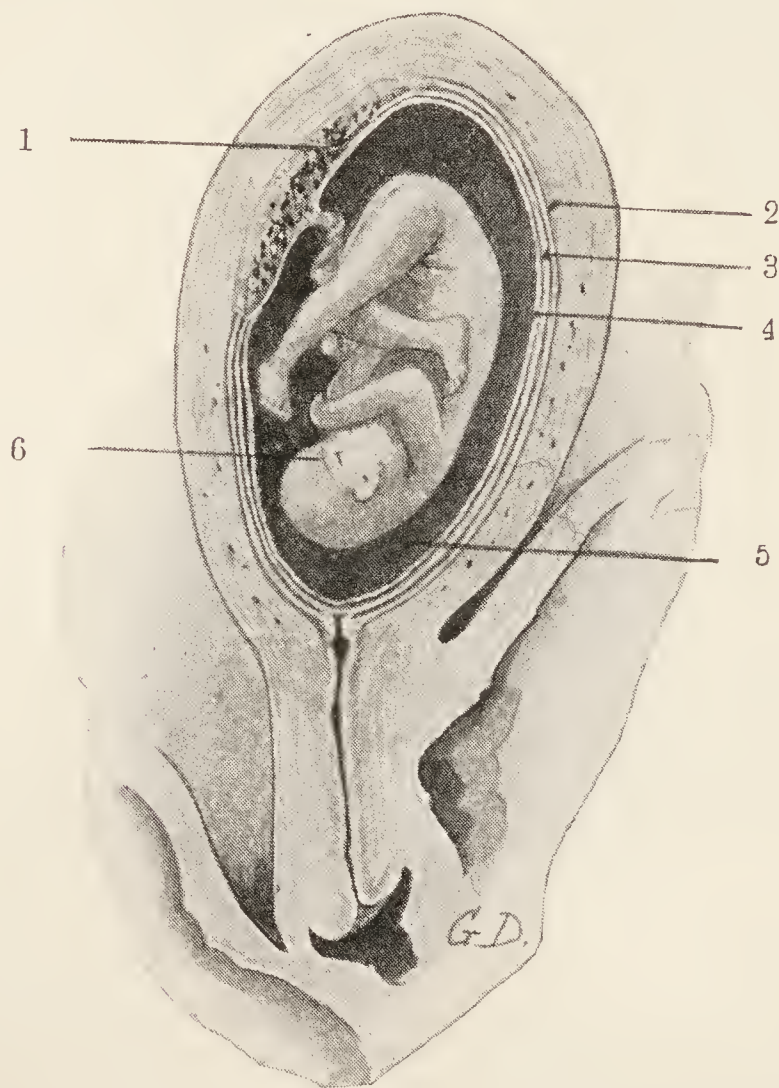


FIG. 11.—Contents of the pregnant uterus after the twelfth week. 1. Placenta; 2. Decidua; 3. Chorion; 4. Amnion; 5. Liquor amnii; 6. Fœtus. The three membranes are purposely shown separated in the diagram: they are, as a fact, united to one another. As the fœtus grows, the decidua capsularis and vera become compressed, so that at term very little of them remains, what there is appearing as patches of reddish shreds.

### Chorion and Chorionic Villi.

When the blastocyst reaches the uterus it is already rough from innumerable shaggy projections known as the primitive

chorionic villi. It is by means of these primitive villi that the blastocyst is able to eat its way into the decidua and, having come to rest, to absorb nourishment from the mother till the perfect chorionic villi are formed.

When the developing blastocyst comes to rest in the decidua the chorionic villi at its upper pole grow and branch very extravagantly, while the remainder atrophy and disappear, the chorionic membrane only being left. That portion of the decidua to which the villi are attached is called the decidua basalis, and from it the maternal portion of the placenta is formed, the remainder covering the ovum over the site of the atrophied villi is known as the decidua capsularis.

### Amnion.

Some of the cells taking part in the formation of the amnion liquefy. The fluid thus formed is called the *liquor amnii*, and this separates the fœtus from the amnion, except where the latter passes on to the umbilical cord so that the fœtus is contained in a bag of liquor amnii. The wall of this bag is thus composed of the chorion and amnion, and these two structures form the membranes of the fœtus. The chorion is outside and from it is formed the fœtal portion of the placenta. The amnion is inside. The liquor amnii is to protect the fœtus from blows and jars and to give it room in which to develop and exercise. During labour the liquor amnii surrounded by the lower portions of the amnion and chorion together form the *bag of membranes* which helps to dilate the cervical canal.

### Embryo.

Floating in this bag of liquor amnii is the embryo. The embryo, however, is not floating free, but is attached by a stalk to that portion of the chorion from which the villi are growing and which is the fœtal portion of the placenta.

Into this stalk two arteries and one vein, known as the *umbilical arteries and vein*, grow from the fœtus and the stalk is now known as the *umbilical cord*. These arteries and vein having grown as far as the villi, divide into innumerable branches, one arterial branch and one venous branch passing

into each villus. Most of the chorionic villi are composed on the outside of a thin layer of cells containing very minute and thin-walled blood-vessels. These villi, as already mentioned, dip into the intervillous space, and it therefore comes about that the fœtal blood in the vessels of the villi is separated from the maternal blood in the intervillous space only by the thinnest of tissue.

It only remains to describe how the fœtal portion of the placenta is attached to the maternal portion ; in other words, why the weight of the embryo pulling on the chorionic villi does not drag the latter out of the intervillous space. Just as a house may be held together by steel girders so are the maternal and fœtal portions of the placenta held together by certain of the chorionic villi—differing in structure from the others—which stretch between the decidua basalis and the chorion, and do not nourish the fœtus.

**The Fœtal, Villous and Placental Circulation.**—Before birth the kind of blood circulating through the vessels of the umbilical cord is the reverse to that which obtains in the circulation of the body, inasmuch as the arterial blood is flowing into the fœtus through the umbilical vein and the venous blood is flowing out of the fœtus through the umbilical arteries, and the same obtains in the circulation of the chorionic villi. The blood flowing from the veins of the chorionic villi into the umbilical vein has been purified by the arterial blood in the intervillous space, into which, it will be remembered, small arteries open. The oxygen of the maternal blood soaks through the thin outer covering of the villi into their veins. Together with this oxygen, water, salts, proteids, fats and sugar also soak through, and all of them are carried along the umbilical vein to the fœtus, where they are used in the process of its growth. As a result of this growth waste products are formed such as carbonic acid, certain salts, and other substances. These waste products are absorbed into the blood of the fœtus, which in its turn is pumped by the fœtal heart into the umbilical arteries and thus into the arteries of the chorionic villi. On their arrival in the blood of these arteries the waste products soak through the outer covering of the chorionic villi into the intervillous space to be carried thence by the uterine sinuses into the circulation



of the mother, whence they are got rid of through the medium of her lungs, kidneys, digestive tract and skin. From this it will be seen how, till the child is born, the placenta fulfils the functions of the lungs, kidneys and digestive organs of the foetus.

**Growth of the Foetus.**—That the growth of the foetus is extremely rapid is evidenced from the fact that in 40 weeks it grows from a single cell about  $\frac{1}{100}$  of an inch in diameter and, even if one could be obtained, too light to be weighed, to a child measuring in length 20 inches and weighing on an average 7 pounds. The weight is not nearly such a good indication of the intra-uterine age of the foetus as its length, as it varies in some cases strikingly both above and below 7 pounds. The length, however, is more or less constant. The intra-uterine age of a child at and after 20 weeks can be nearly accurately calculated by halving its length thus— at 20 weeks it is 10 inches long, 30 weeks it is 15 inches long, and 40 weeks it is 20 inches long. As a rule males are somewhat heavier than females, and the weight of the child tends to increase with successive pregnancies.

## CHAPTER IV.

### Antenatal Conditions.

**The Care of the Pregnant Woman.**—Pregnancy being a physiological condition there is no need to alter the mode of living, supposing it to be a healthy one, of a woman who becomes pregnant. Nevertheless, the ideas women have of what is really a normal method of living vary so enormously that it is all for the good of a woman, and especially when she is pregnant for the first time, that she should be given certain information which will redound to her well-being. Moreover, as nurses are often called upon to give advice in such circumstances, the following information may assist them :—

**Dress.**—It is unwise for a pregnant mother to catch cold, and, therefore, if she can be persuaded to do so, she should wear woollen underclothing. There are various parts of the body which some women are apt to compress, namely, their waists, breasts and legs. The modern fashion of wearing corsets, somewhat low and not reaching to the breasts, and of wearing suspenders instead of garters, obviate these disadvantages mostly, but fashions change, and every woman does not follow them, either from choice or necessity. Although the breasts, especially in some cases towards the end of pregnancy, would be better for a support, it is most important that the nipples should not be pressed upon, in view of the fact that they require to be as perfectly formed as possible for the future suckling of the child. Tightly to compress the waist interferes with the natural growth of the uterus and perhaps the movements of the fœtus. Moreover, as the heart, lungs, liver and kidneys have additional, and very important,

functions to perform during pregnancy, it is not wise to hamper their action by the means of a tight corset. Garters compress the veins of the leg, and in a pregnant woman tend to make the veins varicose, or increase their varicosity if this is already present.

The abdominal wall in a woman who has had one or more children may become very stretched and loose. In such circumstances, as the uterus enlarges it may fall forward and cause a good deal of discomfort. This can be remedied by the patient wearing a well-fitting abdominal belt.

**Diet.**—A pregnant woman usually eats more food than when she is not pregnant; it is therefore desirable that her food should be as digestible as possible. Moreover, the greater the quantity of food taken, the larger will be the amount of waste products which will have to be excreted, and this in spite of the fact that a careful selection is made of the diet. If, in addition, the woman partakes of food the digestion of which will result in the elaboration, when compared with plain articles of food, of an additional amount of waste products, her excretory organs are unduly taxed. Now there are certain very serious diseases of pregnancy which, even if they do not owe their origin to the waste products of the woman, are certainly more likely to supervene if her excretory organs are unduly taxed. Red meat, therefore, should be taken only once a day, and all highly seasoned articles of diet should be prohibited. The woman should be encouraged to drink plenty of water so as to increase the action of her kidneys, by which means some of the waste products may be got rid of the more easily. Alcohol is best avoided.

**Baths.**—Certain waste products are excreted by the sweat glands of the skin. That these waste products are deadly is proved by the fact that if a rabbit is varnished it dies, which also was the end of a little boy who took the part of a Cupid in a tableau at a celebrated ball in Paris. To make his appearance more striking he was covered with gold leaf, but unfortunately, as the result thereof, he died in convulsions. Dirt occludes the mouths of the duct of the sweat glands. It is obvious, therefore, how important it is that a pregnant woman, as others, should have a warm bath daily, using plenty of soap in the process, special attention being paid to the



nipples and vulva. Probably it is better to take the bath before going to bed.

**Nipples.**—It is of the greatest importance, both to the mother and the child, that the latter should be fed by the breast ; unfortunately many women, sooner than forego pleasure by giving up their social functions for a few months, refuse to nurse their children. Others, while willing and wishful to nurse their children, are unable to do so, either because their nipples are retracted or sore. For the child to suck properly the nipples should project well beyond the breast. This may be encouraged by the woman drawing the nipples out and massaging them with her fingers every day and by avoiding the pressure of corsets. Nipples that have not been treated properly during pregnancy, or after labour, are more likely to get sore. The woman should wash them every morning with soap and water, at the same time scrubbing them lightly with a clean tooth or nail brush to remove any dried secretion and shed portions of skin.

**Morning Sickness.**—The majority of women for the first time pregnant complain of a troublesome nausea, occurring in the morning and lasting from the second to the fourth month. Some of them suffer from vomiting. Such a condition is best treated by the woman staying in bed somewhat longer than usual and taking a glass of milk and a biscuit, or a slice of bread and butter, before she gets up. There are certain varieties of vomiting which seriously affect the pregnant woman (see pp. 65, 66), and which may threaten her life. If therefore the nausea and vomiting is more than trifling, or lasts longer than usual, it is desirable that a doctor should be consulted.

**Regulation of the Bowels.**—The danger of an accumulation of waste products in the circulation of a pregnant woman has already been insisted upon. That a large amount of waste products are normally excreted through the alimentary canal is evident from the fact that a patient who is suffering from unrelieved intestinal obstruction dies as a result of their poisoning. A pregnant woman especially, therefore, should be certain that she has a daily evacuation of the bowels. As strong purgatives, in some cases, tend to cause miscarriage their use should be avoided. Plenty of fruit will suffice

to ensure a proper action of the bowels in many women, others will require some mild aperient such as cascara sagrada, liquorice, senna pods or saline.

Hæmorrhoids are not very uncommon during pregnancy, and if present may be the source of great pain and worry. A daily action of the bowels is imperative, after which the parts should be washed with a sponge and water and then with cold boric lotion. If the hæmorrhoids are prolapsed they must be replaced.

**Mouth.**—The mouth and teeth should be attended to daily. The organisms in a dirty (septic) mouth are carried by the food into the stomach and intestines and may interfere very considerably with good digestion and, being absorbed, may even give rise to a septic condition. Moreover, the teeth of a pregnant woman are apt to decay more easily than one who is not pregnant, and if necessary the woman should certainly seek the advice of a dental practitioner.

**Exercise.**—Seeing that a pregnant woman has to supply the food for the growth of her unborn child, as well as to excrete the large amount of waste products that are formed by its extremely rapid growth, it is obvious that her digestive and excretory organs will be severely taxed. She should therefore lead a quiet healthy life, having plenty of fresh air, and walking exercise daily short of fatigue, by which means she will be enabled to throw off the waste products more easily. Dancing, cycling, golfing, hunting, driving a motor, the use of a sewing machine, and in fact any hard work, should be avoided.

### Antenatal Examination.

It may truly be said that the future of a nation is wrapped up in antenatal care. It is the experience of all medical men in charge of maternity beds that the percentage of serious complications of pregnancy and labour has notably decreased since antenatal clinics were established at their hospitals. Unfortunately every woman cannot go to a hospital for antenatal advice, and many of those who are able to do so will not. This loss of antenatal care in a hospital clinic has now been met by the establishment of antenatal centres in most towns

in the United Kingdom, to which any pregnant woman who applies is cordially welcomed. It should be the object of every nurse, therefore, who has the opportunity, to persuade pregnant women, not under the direct supervision of a medical practitioner, to attend an antenatal centre. It is taken for granted that a medical man will send his patients to such a centre, or otherwise will examine them himself, at stated intervals.

At the antenatal centres the urine of the pregnant woman is examined repeatedly, so that if toxæmia of pregnancy is supervening, albumin, which is a warning sign, can be detected and the toxæmia in most cases arrested. Her pelvis is measured, and the relation of the size of the head of the child to that of the pelvis of its mother is noted, so that difficulty in labour is obviated. The lie of the child is determined and if necessary rectified, again anticipating a difficult labour. Advice is given on the lines indicated on page 42 under "Care of the Pregnant Woman," also as to the preparation of the room and accessories for labour, and minor ailments are treated.



## PART IV.

### CHAPTER V.

#### HÆMORRHAGE.

HÆMORRHAGE in gynæcological cases is in the Syllabus of the General Nursing Council, as one of the subjects of the examination. I take this to mean hæmorrhage of such a nature that every endeavour must be made to stop it, before the doctor arrives.

Such a definition would include hæmorrhage in cases of some fibroid tumours, cancer, metritis, injuries to the genital organs, miscarriage and post-operative. Hæmorrhage in cases of fibroid tumours, cancer and metritis is very seldom of such an urgent nature that a nurse cannot wait without detriment to the patient, till the arrival of the doctor.

Although ante-partum and post-partum hæmorrhage are not mentioned as such, as subjects for examination, nevertheless they are included in this book since it may be that on rare occasions, a midwife or doctor not being available forthwith, a registered nurse, though untrained in midwifery, may be called to the patient and will have to do the best she can.

The treatment of most of the causes of hæmorrhage mentioned is set down in this book, but it may be as well to summarize it.

**Control of Hæmorrhage.**—The methods of controlling hæmorrhage are by

1. Drugs.
2. Hot douches.
3. Pressure.
4. Radium, radon, X-rays.
5. Surgical.

Those at the disposal of a nurse are the first three.

**Drugs.**—The drugs used for the control of hæmorrhage are ergot, or some preparation thereof, an extract from the posterior lobe of the pituitary gland and calcium lactate.

It has been found that ergot as such, either in solution to be used by the mouth, in the form of ergotin as a solution for hypodermic injection or in a solid form to be taken by the mouth, is not so efficacious as one of its extracts which are sold by chemical manufacturers under different names. The author is satisfied with *femergin*, which can be administered either as a liquid or solid by the mouth or hypodermically. This is a trade preparation of ergotamine.

Again, there are various preparations of the posterior lobe of the pituitary gland on the market. The author uses *pitocin*.

The uses and dangers of these drugs are mentioned in the text of this book.

Calcium lactate is used by some doctors to increase the coagulability of the blood as a prophylactic in patients who are likely to lose an abnormal amount thereof.

Femergin and pitocin act on the involuntary muscle, and as the uterus is composed of this kind of muscle, these drugs are given to make the uterine muscle contract, and so prevent so much blood escaping from its blood-vessels.

Since, however, extracts of the posterior lobe of the pituitary gland act only when the woman is pregnant, these drugs are not of any use for hæmorrhage in women who are not pregnant, or in pregnant women in whom the uterus has not commenced abnormally to contract, as in miscarriage, ante-partum hæmorrhage, and during or after labour.

The extracts of ergot are of use in certain cases of fibroid tumours and, perhaps, cancer of the body of the uterus, when the hæmorrhage is not very excessive. They are of no use in cancer of the neck of the uterus and their use in chronic metritis is most disappointing.

In cases of ante-partum or post-partum hæmorrhage, these extracts are of great use, but since they take some little time to act most doctors, unless there is any contra-indication, will use an extract of the posterior lobe of the pituitary gland, since this acts much quicker, but since its action does not last long its administration is followed by that of one or the other

extracts of ergot, the action of which lasts for a comparatively long time.

Calcium lactate is used as a prophylactic in cases of fibroid tumours and chronic metritis when, from experience, it is known that the patient will lose excessively. The result to be obtained in such cases varies considerably.

**Hot Douches.**—Douches of  $115^{\circ}$  to  $118^{\circ}$  F. act by inciting the involuntary muscles of the uterus and blood-vessels to contract. Such douches may be especially useful in cases of miscarriage, ante-partum and post-partum hæmorrhage. They can also be used in an attempt to arrest serious hæmorrhage from the bleeding vessels of cancer of the cervix. These douches can be given in cases of excessive bleeding in patients with fibroid tumours or chronic metritis, but whether they will be effective in any special case can be ascertained only by using them.

**Pressure.**—Pressure is applied by some form of the forceps (tongue, ring or Spencer Wells), by the hand or by plugging.

The nurse will very rarely, if at all, be called upon to use pressure with the forceps to stop hæmorrhage. The cause which occurs to the author is that of a cervix lacerated into the uterine artery, or a large branch thereof, as a result of labour. Even for a midwife, this method of stopping the hæmorrhage is so difficult that she will be sure to try the other methods which she has been taught for dealing with this complication before resorting to this form of pressure. In fact it is only when the midwife has been unable to obtain the assistance of a doctor, and the other methods at her disposal have failed, that she may endeavour, successfully or not, to save the life of the patient by clamping the two parts of the lacerated cervix.

Plugging the vagina (see pp. 269-70) is of distinct use in cases of miscarriage, some cases of ante-partum hæmorrhage and in cancer of the neck of the uterus. In the two former the hæmorrhage may be arrested by the plug causing the uterus to contract, in the latter by the plug preventing the escape of blood from the blood-vessels.

Its use in fibroid tumours or chronic metritis is problematical.

To plug the vagina efficiently is somewhat difficult, and a



hot douche should always be given first, which in itself may help to arrest the hæmorrhage and should certainly clear the vagina of blood clots before the plugging is applied.

Pressure with the hands is used almost entirely for post-partum hæmorrhage. It is true that varicose veins of the vulva, apart from pregnancy, may rupture, or be lacerated by a kick or the breaking of a chamber, but such accidents are very rare, and the hæmorrhage can be at once temporarily arrested by the nurse applying pressure with her fingers and a pad of lint.

**Radium, Radon and X-Rays.**—The arrest of excessive hæmorrhage by these methods is employed in some cases of fibroid tumours, in chronic metritis and in cancer of the neck of the uterus. In the latter case radium can also be used as a palliative measure when the growth is inoperable, and so far it is successful.

Radium and X-rays are both employed for some cases of fibroid tumours of the uterus and for chronic metritis. The disadvantages of X-rays in the case of fibroid tumours are that their use is not likely to be successful in patients under 40 years of age. Moreover, it is not particularly uncommon to find that patients suffering from fibroid tumours, after, say, the age of 45 have also cancer of the body of the uterus, if the patient applies for treatment because of the hæmorrhage. Before X-rays are applied, therefore, the patient should be curetted, so as to obtain a specimen for microscopical examination. Indeed this should also be done in cases of chronic metritis to be treated by X-rays. Also the clinician must be as sure as he can be of the diagnosis, since ovarian tumours and diseased Fallopian tubes have often been mistaken for fibroid tumours. Lastly, X-rays may rarely cause a fibroid to degenerate, which is a serious complication and will have to be surgically treated.

Radium, or radon, has been used in the treatment of fibroid tumours which are causing excessive hæmorrhage, but the reports available are not sufficient to form any definite opinion as to its value in such cases.

In cases of chronic metritis, the usual methods of drug treatment are most disappointing and one but very rarely obtains any success. The treatment by radium, or radon, in

this condition is, however, most successful, and thousands of women have thus been, and will be, relieved of the danger of hysterectomy; of the complications following such an operation, even if they are rare, or of the extra time in bed and of the convalescence. This method of treatment seldom fails to stop the hæmorrhage completely, and in the four cases per hundred or so in which an absolute cure is not obtained, the bleeding will stop for many months, up to a year in some patients, or, and this is the best thing that can happen, the periods will become normal. This latter result could be attained more often if it was known for certain what would be the best dose for each particular patient.

Apart from everything else radium, or radon, has the advantage that the treatment can be carried out at one sitting, whereas that by X-rays requires two or more, according to the practice of the clinician.

Radium, radon and X-rays all act, except in the rare cases mentioned, on the ovaries, thus inducing the menopause. The patient must, therefore, be warned that this will almost certainly occur and that she will be sterilized. Nevertheless, the author once had a patient in whom the application of radium stopped the hæmorrhage for over a year, she then became pregnant and gave birth to a normal child, after which the periods became normal.

## ANTE-PARTUM HÆMORRHAGE.

### Accidental Hæmorrhage. Unavoidable Hæmorrhage.

Ante-partum hæmorrhage is bleeding due to the separation of part, or the whole, of the placenta, from the time the child is viable, i.e. the 28th week to term. There are two varieties, one in which the placenta is situated on the upper segment, known as accidental hæmorrhage, and the other in which the placenta, or part of it, is situated on the lower uterine segment, known as unavoidable hæmorrhage or placenta prævia.

#### CAUSE.—

*Accidental hæmorrhage* is not so named because the placenta has been separated by accident, though in rare cases a severe blow, or fall, may cause such a separation. Cases of accidental



hæmorrhage can be divided into two groups—a toxæmic group and a non-toxæmic. The toxæmic cases are by far the most serious.

*Unavoidable hæmorrhage* is very properly so called, since as the placenta, or part of it, is situated over the lower uterine

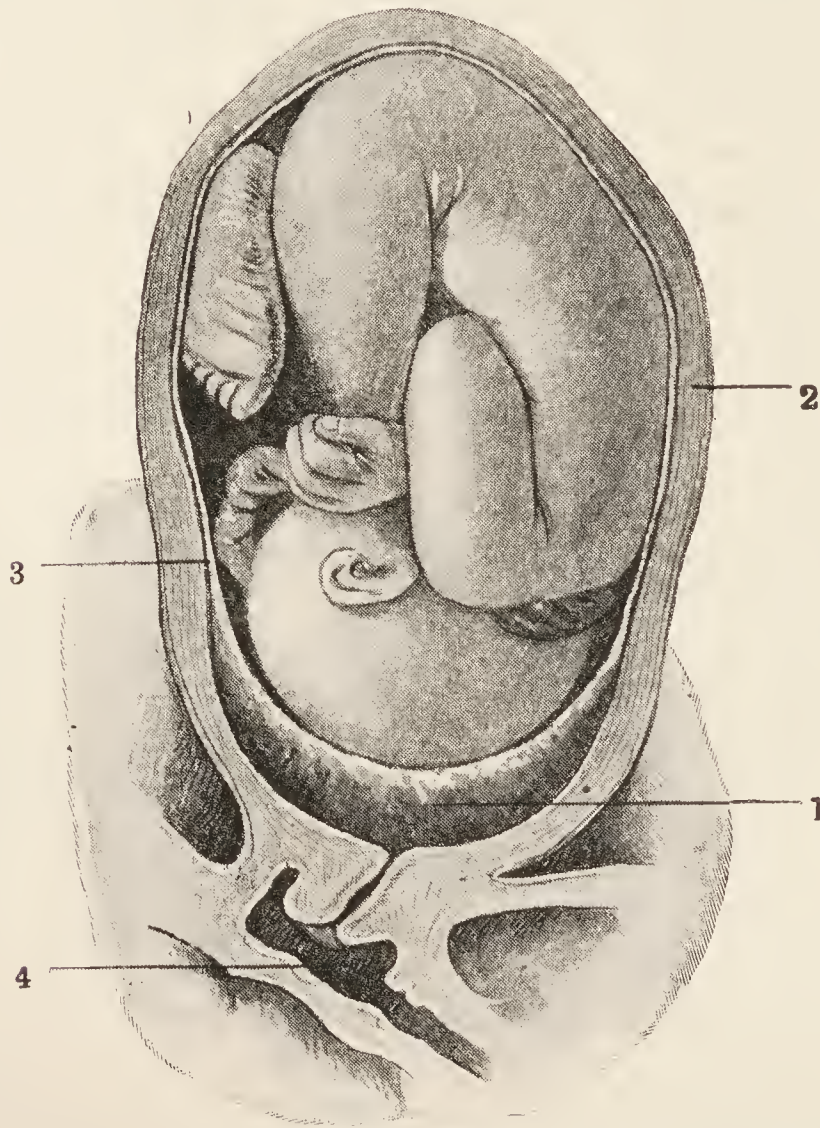


FIG. 12.—Uterus cut in half showing the position of the placenta in the lower uterine segment, in placenta prævia. 1. Placenta prævia ; 2. Wall of uterus ; 3. Membranes ; 4. Vagina.

segment, a portion of it, at any rate, must become separated when this lower segment commences to dilate before labour, or is fully dilated during labour. The placenta being inelastic is unable to remain attached to the lower uterine segment as the latter is stretched, and so becomes detached (Fig. 12).



Any condition which is likely to make the attachment of the placenta less firm than normal can be the cause of accidental hæmorrhage, so that disease of the decidua, forming the maternal portion of the placenta, is responsible in many cases, and for this reason it is more common in multiparæ who are, for one reason or another, more likely to have suffered from some infection of the endometrium. Accidental hæmorrhage also occurs in women who are suffering from some serious constitutional disease, leading to rupture of blood-vessels at the placental site and bleeding into the placenta. The most modern theory of its origin is that it is due to a toxæmia of pregnancy, and it is a significant fact that in the majority of cases albumin is found in the urine.

Why the blastocyst, in cases of unavoidable hæmorrhage, should become embedded in the decidua covering the lower uterine segment, so that the placenta when formed is below the fœtus instead of above it, is not known.

VARIETIES.—*Accidental hæmorrhage* is either *revealed*, in which case the blood escaping from the open uterine sinuses tracks down between the chorion and the decidua, and escapes by the vagina, or *concealed*, in which case the blood is held up, for some reason, in the uterus and distends it, no blood escaping externally; this is a very dangerous variety. There is a third form, really a combination of the two already mentioned, in which most of the blood is held up in the uterus, and a little, principally serum, escapes externally. This is a most dangerous variety in that the fact that there is internal bleeding may escape notice and the external bleeding is so slight that but little attention may be paid to it.

In *unavoidable hæmorrhage* by its situation the placenta prævia may entirely cover the os when it is called complete placenta prævia, partly cover the os when it is called partial prævia, or not cover the os when it is called marginal placenta prævia.

SYMPTOMS.—

In *revealed accidental hæmorrhage* the patient complains of bleeding. She may give a history of a fall, blow, or some unusual exertion. In *concealed accidental hæmorrhage* the patient will probably be very ill from toxæmia and will complain of very great abdominal pain due to the stretching of

the uterus by the retained blood ; the other symptoms will be those of hæmorrhage. In *unavoidable hæmorrhage* the symptoms are those of bleeding, and the history of the bleeding may help since it may start when the patient is sitting in a chair, working or when asleep.

SIGNS.—The signs of *accidental hæmorrhage* are those of bleeding, and in the concealed variety, since no blood can be seen to be escaping, the signs are those of internal bleeding. There is very often albumin in the urine and œdema of the legs, an indication of the toxæmia. In addition, in the concealed, or combined variety, the uterus is tender and feels as hard as a board. In *unavoidable hæmorrhage*, if the nurse is skilled in maternity work, she may be able to identify the placenta by passing a finger through the cervical canal and feeling it.

#### TREATMENT.—

In cases of *revealed hæmorrhage*, if the bleeding is slight, the doctor may treat the patient on the lines indicated under threatened miscarriage. If the bleeding is severe and labour has not started, he will probably apply a binder, rupture the membranes and plug the vagina. If labour has started and the cervix is fully dilated, the doctor will deliver the patient with the forceps ; if the cervix is well dilated, he will probably apply a binder, rupture the membranes and inject some form of pituitary extract.

*Concealed accidental hæmorrhage* is very dangerous because of the shock and internal bleeding, and the uterus may not retract after the child is delivered by the vagina, so that post-partum hæmorrhage may ensue. The doctor will apply an abdominal binder, plug the vagina and treat the shock with warmth and morphia. If the patient improves he will puncture the membranes. If the patient gets worse he will have to perform Cæsarean section or even Cæsarean hysterectomy if the uterus does not retract. It is a very desperate condition and nearly half the women die.

In cases of *unavoidable hæmorrhage* the doctor will deliver the child by inserting a De Ribes's bag ; with the forceps ; by turning or by Cæsarean section, according to which variety of placenta prævia the woman is suffering from, the amount of dilatation of the cervix and the judgment of the doctor in attendance.

### Duties of the Nurse.

If the bleeding is very severe the nurse should give a hot douche and a dose of ergot, or one of its extracts if she has it. In addition she should apply a tight binder and plug the vagina if she has been taught how to do so.

If the bleeding is not so severe as to threaten the life of the patient, and a doctor is likely to be in attendance within reasonable time, the nurse may withhold the administration of the drug so long as she thinks it is safe to do so, of which she can be the only judge, since the doctor on his arrival may wish to turn the child, and if the drug causes the uterus to contract strongly this may be impossible or dangerous. The nurse must have the douche apparatus and hot water ready for treating post-partum hæmorrhage should it occur. If the patient has lost much blood before the birth of the child, then a fatal result from post-partum hæmorrhage may follow a loss so small that if it occurred after a normal first and second stage it would attract but very little notice.

### EXTRA-UTERINE GESTATION.

Since the symptoms and signs of this complication, so far as the nurse is concerned, are those of hæmorrhage, mostly internal, extra-uterine gestation is included in this chapter.

There are two situations in which it is known that an oocyte can become fertilized if a spermatozoon can reach it, namely :—

1. In a Graafian follicle, after this has burst but before the oocyte has been discharged.
2. In the Fallopian tube, before it has reached the uterine cavity.

Fertilization has never been proved to have taken place in the abdominal cavity or in the uterus. It is a fact that rarely a fœtus may be found free, except for certain attachments taking the place of the normal placenta, in the abdominal cavity, and such fœtuses very rarely go on living and growing to term. Nevertheless, in the majority of these cases there is distinct evidence that the fœtus was first in the Fallopian tube and escaped therefrom later, and, in the remainder, the evidence has never been such that competent authorities would admit that the gestation was primarily abdominal. There



does not appear to be any reason, however, why primary abdominal gestation should not occur. So far as the uterus is concerned there is much more doubt. It has already been stated that when the blastocyst reaches the uterus it bores its way into the decidua by means of its external cells. Now it takes an appreciable time for the single celled zygote to divide up into a multicellular blastocyst, and this presumably is why, normally, the oocyte is fertilized in the Fallopian tube, so that by the time it has reached the uterus the cells will be formed sufficiently to enable it to eat into the decidua. If the oocyte reached the cavity of the uterus before it was fertilized, since the blastocyst would not have been formed, the oocyte would be unable to bore its way into the decidua and would be discharged *per vaginam*, as the unfertilized ovum that passes into the uterine cavity must be.

The systematic examination of every organ removed from the pelvis is a routine in well-organized hospitals, and so it has happened that blood-cysts of the ovary have, on microscopical examination, been found in a certain number of cases to be due to ovarian pregnancy.

Lastly, gestation in the Fallopian tube is comparatively common and its existence has been known for many years. Moreover, in animals it has been proved that the oocyte is always fertilized in the Fallopian tube. From a consideration of these points, therefore, it seems most probable that the oocyte of the human female is normally fertilized in the Fallopian tube.

### Tubal Gestation.

#### CAUSE.—

Tubal gestation is due to the fact that the zygote is arrested in the Fallopian tube and continues there to develop. Why the zygote becomes arrested in the tube and does not travel down into the uterus is unknown.

When the zygote is arrested in the tube it subdivides and behaves in exactly the same way as it would have done if it had reached the uterus. It commences to eat its way into the mucous membrane of the Fallopian tube. This in every instance, with one exception, leads to a disaster. The exception is when the zygote dies before it has time to cause

the disaster, and this, so far as is known, is a very rare occurrence.

If the short account of the development of the fœtus on page 37 is understood, it is easy to realize why disaster follows the implantation of the blastocyst in the mucous membrane of the Fallopian tube.

In bygone ages the developing blastocyst learnt to bore a certain distance into the decidua of the uterus and no further. To meet the depth of this intrusion the decidua of the uterus undergoes certain changes, one of which is an increase in its thickness. Now the mucous membrane of the Fallopian tube, to start with, is not so thick as that of the uterus; moreover, it does not undergo changes, when the woman becomes pregnant, similar to those in the uterus.

As the blastocyst does not stop until it has reached a certain depth, and as this depth is greater than the thickness of the mucous membrane of the Fallopian tube, it results that the muscle of the tube must be penetrated, and in this muscle are blood-vessels. In due course one of these vessels is opened by the trophoblast of a chorionic villus. The result is inevitable; blood escapes between the muscle fibres and round the developing blastocyst. The tube, being unable to stand the pressure of the effused blood, ruptures and the blood escapes carrying with it the growing fertilized ovum, with one of the following results:—

1. The blood may burst out of the tube, a condition known as *tubal rupture*. In this case the mother may die of internal hæmorrhage, or she may live; if she lives the local condition is known as a *pelvic hæmatocele*, which signifies a collection of blood in the pelvic cavity. The growing fertilized ovum is destroyed.

2. The blood may burst into the lumen of the tube and then escape through the abdominal opening of the tube with similar results to the above. This is called *tubal abortion*. The growing fertilized ovum is destroyed.

Very rarely the fertilized ovum erodes through the walls of the tube without injuring any large blood-vessel, and oozing, as it were, through a small hole in the peritoneal coat becomes adherent to intestine or omentum and continues to develop,

even in very rare cases, to term. This is called *tubal erosion*. The mother at the time of the tubal erosion may experience some slight abdominal pain, but nothing more.

Of these events tubal erosion is by far the rarest.

It is interesting to note what may happen subsequent to a tubal erosion :—

1. The fœtus may die and become converted into a mummy, or it may become impregnated with lime salts and a lithopædion results, or it may become converted into soap (adipocere). The fœtus may remain as a mummy or lithopædion for many years ; in fact, the woman may live to old age and die of some intercurrent disease.

2. The mummy or lithopædion may, however, become infected by microbes from the intestine and suppuration result, the pus and bones escaping into the bowel, bladder, vagina, or through the abdominal wall ; the patient dying, or not, as the case may be.

3. The sac surrounding the fœtus may rupture and furious internal bleeding take place, the fœtus being destroyed and the mother dying unless rescued by immediate operation.

4. The fœtus may continue to develop till term, when a false labour will take place. Then either the fœtus will die and the further changes will be similar to those described under 1 and 2, or the sac will rupture, and the result will be similar to that mentioned under 3.

SYMPTOMS AND SIGNS.—

**Before Tubal Rupture or Tubal Abortion.**—Tubal rupture, or tubal abortion, takes place before the 12th week of pregnancy, as a rule between the 6th and the 10th week. It has taken place 10 days after impregnation.

The woman in the majority of cases will give a history of having missed one or two periods, perhaps of a little morning nausea and, maybe, of the breasts having become tender and a little swollen. In addition, she will certainly complain of pain in the lower abdomen on one or other side.

**At Tubal Rupture or Tubal Abortion.**—A history similar to that noted above may be obtained : in addition, the woman is suddenly seized with great abdominal pain and she will most likely faint and break out into a cold perspiration. On recovering consciousness she may be sick.



Her pulse is feeble and soft, and its rate will be very rapid. She will be deathly white, her temperature may be sub-normal, and she may be restless. She will complain of faintness, noises in the ears, and perhaps of want of breath—"air hunger."

She has a feeling of sinking through the bed, respiration may be hurried and of a sighing character, the surface of the body is cold; in fact, all or many of the signs and symptoms of serious *internal hæmorrhage* may present themselves.

So great can be the loss of blood that the patient may suddenly fall back dead, or die in a few minutes, or if the internal hæmorrhage is less rapid, she may die in a few hours unless rescued by operation.

If a patient has a tubal pregnancy, changes take place in the mucous membrane of the uterus comparable, up to a certain stage, to those which occur when the pregnancy is intra-uterine (formation of the decidua).

At the time of tubal rupture, or tubal abortion, a dark brown discharge may flow from the vagina, and if special care is taken to examine carefully this discharge, a membrane, which is the decidual lining of the uterus, will be found, either whole or in pieces.

The identification of this decidua is most important, since at times the diagnosis between tubal gestation and an ordinary miscarriage may be very difficult to determine, and the examination by the doctor of the piece of membrane will settle the matter. The nurse must therefore be careful to save everything which is passed from the vagina for the inspection of the doctor.

**After Erosion.**—The symptoms will be those of pregnancy corresponding to the period to which the fœtus has developed, together with, as a rule, some abdominal pain, and the woman may seek advice because "the child is all on one side."

If, during the growth of the fœtus, the sac ruptures, then all the signs and symptoms of internal hæmorrhage will be present.

If the pregnancy goes to term a false labour comes on with regular pains and discharge.

Tubal rupture, or tubal abortion, is in most cases easily diagnosed, and is a condition which every trained nurse, sooner or later, will have to nurse. An example of how typical such cases are is that of a patient who was admitted to the Middlesex Hospital. The husband of this patient was in the habit of visiting one of the Public Libraries in the neighbourhood. In due course he came across a work by Sir John Bland-Sutton, and was very interested in the description of tubal gestation contained therein. One day his wife became alarmingly ill and the symptoms and signs that presented themselves to the husband, so far as he could recognize them, tallied exactly with those described in the afore-mentioned work. Accordingly the husband hastened to the hospital, and asked the House Surgeon on duty to admit his wife because she had a ruptured tubal gestation. The House Surgeon was recently qualified, the husband was of the artisan class, and it is easy to imagine the conversation that must have taken place, the House Surgeon incredulous, the husband insistent. In the end the House Surgeon was so impressed by the despair of the husband that he agreed to admit the wife from whom, shortly after admission, a ruptured tube was removed and her life undoubtedly saved.

#### TREATMENT.—

Tubal gestation is a very dangerous complication. If the condition is diagnosed before rupture or abortion the diseased tube should be removed in order that the aforementioned complications may not occur.

If the patient is suffering from internal hæmorrhage, due to tubal rupture, or tubal abortion, an immediate operation is necessary.

If the doctor first sees the patient after the formation of a pelvic hæmatocele he may decide to treat the patient with rest and hot douches, because in a certain percentage of cases the blood is absorbed. Since, however, it is a fact that in some of these cases the internal hæmorrhage recommences, or the pelvic hæmatocele, becoming infected from the bowel, is converted into a pelvic abscess, most doctors decide to operate.

Tubal erosion has to be treated by abdominal section, a very dangerous operation, and increasing in danger as the period of pregnancy advances.

## PART V.

### CHAPTER VI.

#### Toxæmia of Pregnancy.

TOXÆMIA during pregnancy may declare itself in various forms, the chief of which are the pregnancy kidney, eclampsia, pernicious vomiting, and pernicious jaundice. The two latter are very rare. All these serious conditions have a similar origin, namely, the absorption of some poison or poisons which, acting in different ways and picking out more particularly different organs, give rise to the various complications noted above. Whether the poison is derived from the mother or from the fœtus is not finally settled, although the balance of opinion inclines to that of a fœtal origin. Nevertheless, even if it is granted that the poison causing the particular disease is entirely fœtal in origin, the condition of the mother must claim a large part in the supervention of toxæmia, since, taking into account the number of pregnant women, this toxæmia is rare, and it has never been suggested that the fœtal tissues in some cases excrete this poison and in others do not. The toxæmia is therefore intimately associated with the pregnancy on the woman's side. It has already been pointed out that not only does a pregnant woman herself make more poisons (waste products) that she has to get rid of, but she has also to eliminate the waste products made by the very quickly growing fœtus. The poisons circulating in the blood of any person have to be rendered harmless by certain processes in the liver, and expelled from the body through the channels of the kidneys, intestines and skin, in the medium of expired air, bile, urine, fæces and sweat. The organs concerned in these antedotal measures, when acting normally, are



enabled to get rid of these poisons and the person is kept in health. If, however, these organs are the seat of disease, or are overtaxed, they are not able to do their work so efficiently and the individual is more or less poisoned. Now, although the function of the liver and kidneys, as of other organs, is augmented during pregnancy, there is no doubt that the border line between their physiological and pathological action is a slender one. When a woman becomes pregnant, all her organs are unduly taxed, and in some cases overtaxed. Women differ in their resistance to poisons resulting from pregnancy, as they do in resistance to diseases when they are not pregnant, and just as a non-pregnant woman will easily acquire some complaint to which another is immune, so one pregnant woman can deal with the poison excreted by the foetal tissues, as well as the additional amount of her own waste products, while others fall a victim thereto. The digestive and excretory organs in some women cannot stand this extra amount of work, and so are damaged and are thereby unable entirely to eradicate the poison, so that, instead of it all being rendered innocuous and expelled, some of it remains circulating in the blood. In the same way some women are able to withstand the foetal poison and eliminate it, whereas in others the foetal poison has a pathological effect on the liver and kidneys, and even if these organs are not actually injured by the poison, the fact that they are overtaxed by the waste products prevents their eliminating it as they should, the result being that the foetal poison also is circulating in the mother's blood. With this short discussion of the subject the various forms of toxæmia will briefly be noted.

**The Pregnancy Kidney.**—This complaint is much more common in women pregnant for the first time (*primigravidæ*) than in women who have had children (*multiparæ*). It generally appears in the latter half of pregnancy. The severity of the disease varies, for whereas in some women it is only first discovered by finding albumin in the urine during the routine examination, others complain of headache, defective eyesight, swelling of the eyelids, hands, feet, and vulva, sickness, indigestion, all or any of these. The amount of albumin varies from a very little to a great deal, while the quantity of urine may be diminished. When the disease is

discovered and treated in its early stages the patient, as a rule, quickly gets better. More rarely the woman is left with her kidneys permanently damaged.

#### TREATMENT.—

The patient is kept in bed and her diet is arranged so that as little proteid as possible is taken. Proteid is split up by the digestive organs into a nourishing and a poisonous portion. The poison, if the digestive organs are healthy, is rendered innocuous and then expelled. The wisdom therefore of reducing the amount of proteid when the digestive organs are not acting normally, is obvious. In severe cases the diet consists mainly of milk. In the less severe cases fish, eggs, milk puddings, bread and butter and tea or cocoa are allowed. A careful chemical examination is made of the urine every day and the bowels are kept well open. If in spite of treatment the condition does not improve, the pregnancy is terminated.

#### NURSING.—

The nurse must measure and chart the amount of urine passed daily. She should also put up a specimen every day for the doctor to examine if he wishes to. She should ensure that the patient drinks plenty of water and is kept warm.

**Eclampsia.**—If the toxæmia in the pregnancy kidney is of an acute type, there is danger of eclampsia developing. Eclampsia, which is one of the most dangerous complications of pregnancy, is a condition in which the woman suffers from fits, and it occurs twice as often in primigravidæ as in multiparæ. The mortality is 22·1 per cent. in the mothers and at least 40 per cent. in the children, death taking place during or after the fits. The fits may appear without any warning if the urine has not previously been examined. The presence in the urine of a large quantity of albumin, a diminished quantity of urea, perhaps blood, a marked diminution in its quantity and a rise of blood-pressure over 160 mm. are signs of very serious import.

Apart from the findings in the urine and rise in blood-pressure, the other warning signs may include a severe and constant headache, epigastric pain and perhaps vomiting, œdema especially in the vulva and upper part of the body and

serious interference with vision, in some cases even temporary blindness.

The fits, which are very characteristic, have three stages. First a *premonitory stage* in which there are twitchings of the head and face. This is succeeded almost at once by the *tonic stage*; the patient becomes rigid from contraction of her muscles. The diaphragm and chest muscles being fixed, air is unable to enter the lungs and the patient becomes cyanosed. The jaws spasmodically contracting may trap the tongue, which is thus bitten. In about half a minute the third or *clonic stage* supervenes which lasts up to two minutes, and in which the muscles are alternately contracted and relaxed. The movements of the lower jaw churn the saliva into a froth and the patient foams at the mouth, the foam being coloured if there is bleeding from a bitten tongue. The breathing is stertorous, the patient is unconscious, and at the end of a fit passes into a *coma*.

The state of coma may soon pass off, or the patient may die without regaining consciousness, or the coma may last some time, when, on regaining consciousness, the patient does not remember anything that has happened.

#### TREATMENT.—

The treatment is first concerned with the fit itself and afterwards with the prevention of its recurrence.

During the fit steps must be taken to prevent the patient from hurting herself and from being suffocated. The patient, therefore, should not be moved during the fit. A pillow should be placed under her head and her clothes should be loosened. A gag, made by wrapping a handkerchief or a piece of towel round the handle of a spoon or piece of wood, should be placed between the teeth to prevent the tongue being bitten. The head should be turned to one side so that the saliva runs out of the mouth instead of into the lungs, otherwise the patient may be suffocated or broncho-pneumonia may develop.

The steps taken by the doctor to prevent the recurrence of the fits include keeping the patient in bed and the administration of various drugs such as morphia, chloral hydrate and potassium bromide. In addition he will endeavour to dilute the poison and eliminate it through the kidneys by ordering large quantities of water to be drunk, and through the bowels



by giving purgatives which cause watery evacuations. Rectal salines, or, if the patient is unconscious, subcutaneous or intravenous saline infusions, hot baths, hot packs or hot-air baths to get the skin to act may also be ordered. In addition the doctor may deem it necessary to bleed the patient, and to deliver her with the forceps as soon as it is safe to do so.

**Pernicious Vomiting.**—This disease, otherwise known as hyperemesis gravidarum, is a rare complication in the latter months of pregnancy and is, as a rule, fatal. It is mentioned here chiefly because it is apt to be confused with another variety of vomiting known as *neurotic vomiting*, which occurs, as a rule, during the first half of pregnancy.

DIAGNOSIS.—

Both in the neurotic and pernicious variety the patient may vomit anything that she takes into her stomach; she will get emaciated, her breath will be very offensive and her pulse-rate will be raised. The urine of a patient suffering from toxæmic vomiting will contain albumin, the vomit may contain blood, the patient is very likely jaundiced, and the disease runs an acute course. On the other hand, neurotic vomiting runs a chronic course: there is not any albumin in the urine or blood in the vomit and the patient is not jaundiced.

TREATMENT.—

The only chance the woman has, if suffering from pernicious vomiting, is for the pregnancy to be terminated. A pregnant woman suffering from neurotic vomiting may be very ill and indeed die if proper care be not taken. Nearly every case of neurotic vomiting, however, can be cured without terminating pregnancy, if properly treated.

NURSING.—

**Neurotic Vomiting.**—The successful treatment of a patient suffering from neurotic vomiting will depend largely on the efforts of her nurse. If only the patient can be persuaded that she is going to get quite well, and is protected from fussy and anxious relatives, and her mind is kept off the idea of vomiting by removing all such incentives as basins, towels and macintoshes from her bed, she will recover in two or three days or less. It is better not to give these patients liquid food. The nurse should be kind but firm, insist on the

patient swallowing solid food and standing over her while she does so. Patients suffering from neurotic vomiting can be cured at once by being sent into a hospital or nursing home and treated on the lines indicated above.

**Pernicious Jaundice.**—This rare and most serious complication, otherwise known as acute yellow atrophy of the liver, generally occurs in the latter months of pregnancy, or even does not supervene until after the child is born. The patient nearly always dies. The prominent symptoms are acute abdominal pain, severe headache, vomiting and diarrhœa, jaundice and drowsiness, passing into coma. The skin of the patient, her vomit and urine are markedly jaundiced and the latter contains albumin and often blood.

**TREATMENT.**—

The patient is treated on the lines already indicated under the pregnancy kidney; and if the woman is still pregnant, the uterus is emptied.

## PART VI.

### CHAPTER VII.

#### Miscarriage.

THE term abortion is best kept for the criminal termination of pregnancy. In the first few weeks of pregnancy the entire contents of the uterus will most likely be expelled. A placenta first begins to appear at the 10th week of pregnancy, but from then to the 28th week there is no "postage stamp" layer. The result is that if a miscarriage occurs between the 10th and 28th week, the uterus has difficulty in expelling the placenta, and part, or all of it, may be retained. Unless such a patient is properly treated, serious hæmorrhage and sepsis may result. It is for this reason that abortionists do not care about applying their illegal trade after the 3rd month. From the 28th week onwards the "postage stamp" layer is in process of being perfected, and the nearer the gestation approaches term the more easily will the placenta be separated naturally.

Miscarriage is most common in the first three months, and it occurs at least once in every five pregnancies.

CAUSE.—

If the fœtus dies the woman must miscarry. The fœtus can be killed by depriving it of its proper blood supply, as when a portion of the chorionic villi, or placenta, becomes separated by some jar or injury or by some disease of the mother such as kidney disease or syphilis; by the mother being poisoned, most commonly by lead; by a backward displacement of the uterus so that this organ cannot rise into the abdomen and there is therefore no room for the uterus to expand; by certain diseases of the placenta or membranes;



by conditions or drugs which make the uterus contract, such as fright, exertion, or ergot; by strong purges and so on. Some women, however, in the absence of any known cause, miscarry easily and repeatedly, and this unfortunate complication is known as the *habit of abortion*. On the other hand, some women may use every endeavour by violent exercise, or by poisoning themselves with drugs or purgatives, to produce a miscarriage and fail. There is no drug known which will certainly cause a miscarriage, neither is there any method of producing a miscarriage with certainty, other than that of rupturing the membranes, or dilating the cervix and removing the contents.

#### SYMPTOMS.—

The chief symptoms of miscarriage are bleeding due to the partial, or complete, separation of the fœtus and its coverings and abdominal pain due to the contractions of the uterus. The fact that a woman bleeds during the first three months of her pregnancy is no proof that a portion of the villi or placenta has separated, although in most cases this is so, and certainly it is after the 3rd month. The fœtus, however, is not large enough entirely to fill the cavity of the uterus till the 3rd month, and until it does there is a cavity of varying size lined by the decidua, vera and capsularis, and bleeding may, though it rarely does, take place from these membranes.

#### SIGNS.—

The chief sign of a miscarriage is that of bleeding, and in some cases part of the contents of the uterus can be felt projecting through the dilating cervix. In a septic miscarriage the patient will have high fever and a very offensive discharge.

#### VARIETIES.—

Miscarriage is said to be either *threatened* or *inevitable*. Threatened if a small portion only of the villi or placenta is separated and, if the fœtus has not already been killed by some disease or drug, the pregnancy may, with proper treatment, continue to term and a healthy child be born. When, however, the bleeding is severe, indicating that a large portion of the villi or placenta has separated, or when the abdominal pain is very acute, showing that the contractions of the uterus will surely cause separation, the miscarriage will certainly take

place. There are two forms of inevitable miscarriage, *complete* when all the contents of the uterus come away, and *incomplete* when a portion of the placenta is retained.

#### RESULTS.—

Miscarriage is such an apparently harmless complication, and the contents of the uterus are expelled so easily, that some women are unaware of its occurrence, or realizing their condition, ignore it, and continue their usual vocation. Rarely the amount of blood escaping places their lives in jeopardy. The common danger is that of sepsis, which may lead to a fatal termination, but more frequently to a septic condition of the uterus and Fallopian tubes. Septic miscarriage, therefore, is a frequent cause of sterility, and is the commonest cause of diseased Fallopian tubes and ovaries—conditions leading to much misery and invalidism, and in many cases to very dangerous operations which may result in death. The fact that a woman has had one miscarriage makes her more liable to have another.

#### TREATMENT.—

**Threatened Miscarriage.**—The patient must be kept strictly in bed, not being allowed to get out, either for defæcation or micturition, and that for at least a week after the last sign of blood has disappeared. She should be kept absolutely quiet, free from all disturbing influences such as visitors, noise, newspapers, and letters. The bowels should be kept acting with mild aperients and the diet should be of a simple variety. All highly seasoned articles of food and alcohol should be strictly forbidden. In addition, the doctor will examine the patient with a view to ascertaining and treating the cause if possible, and in addition, he will give her some preparation of opium.

**Inevitable Miscarriage.**—If the abortion is not septic or the bleeding is not excessive, inevitable abortion is properly treated by allowing Nature to terminate the pregnancy. If, however, sepsis is present or the life of the woman is in danger from bleeding, the doctor will empty the uterus.

#### NURSING.—

The nurse will strictly carry out the doctor's orders. In cases of threatened miscarriage she will follow the treatment

detailed above so far as she may be able. In addition, the nurse must not give the patient any food before the doctor has seen her in case he decides to empty the uterus, for which purpose an anæsthetic will be required. The nurse must also save a specimen of the urine and everything that the patient passes from the vagina, this latter duty being most important, as the doctor will wish to know what has been expelled, and if so, whether all of the uterine contents. If the doctor decides to empty the uterus, the nurse will have to prepare the patient and her surroundings just as for any other operation. If the patient is bleeding very badly and the doctor has not arrived, the nurse should give an antiseptic douche at a temperature of  $118^{\circ}$  F. with the object of making the uterus contract down on to that part of the ovum which has separated and so plug the mouths of the bleeding vessels. If she has any femergin or pituitary extract the nurse should give a dose with a similar object. If these measures are not sufficient and the nurse is capable of doing so she should plug the vagina. See p. 269.

If after the miscarriage the patient is suffering from shock, the nurse will have to carry out the treatment ordered by the doctor.



## PART VII.

### PARTURITION.

#### CHAPTER VIII.

##### STAGES OF LABOUR. POST-PARTUM HÆMORRHAGE.

PARTURITION, which starts with the dilatation of the cervix and ends normally with the expulsion of the placenta and membranes, is divided into three stages, the first, second and third; and concerned in the mechanism of labour are four factors, the uterus, the placenta and membranes, the auxiliary muscles, and the child.

The mechanism of a perfectly normal labour only will be dealt with here, and that only in a summarized manner. For a detailed account of labour and its efficient management the nurse may refer to the author's *Handbook of Midwifery for Midwives and Obstetric Dressers*.<sup>1</sup>

**Date of the Onset of Labour.**—No one can predict with certainty the time labour will commence, and it is not known what starts the process. The nearest date one can fix upon is 280 days, or 40 weeks, from the first day of the last menstrual period, since this is found to be correct in the average number of cases. The reason why an exact calculation cannot be made is because it is impossible to tell when the spermatozoon fertilized the oocyte. It might be thought that in those cases in which a single coitus had taken place it would be easy to calculate the date of the labour, but since it is known that spermatozoa will remain alive in the genital canal for 10 days at least, after a single coitus there would be a doubtful period of 10 days. In the vast majority of cases a single date cannot be obtained, and whether the oocyte became fertilized just

<sup>1</sup> Cassell & Co., 8th Edition.

after the last menstrual period, or any time between this and the date of the next period, must always remain uncertain. It is known that the most likely time for a woman to become pregnant is the first three or four days following the cessation of the period, and so the calculation is made from the first day of the last period. On occasions, further difficulties may arise in "giving a date" because a woman may become pregnant during a period of amenorrhœa (absence of menstruation) due to her nursing her last child, or to some constitutional condition and, therefore, in the latter event, if the calculation was made from the last menstruation it might be quite wrong. Again, a woman may have a monthly discharge of blood for the first one, two or three months of pregnancy, and a calculation made in such circumstances would lead to a mistake. Very rarely a girl has been known to become pregnant before she has ever menstruated. Doctors, therefore, do not rely entirely on the method of counting 280 days from the commencement of the last period but, and especially in any doubtful case, check such a calculation with the appearance of certain events in pregnancy, such as morning sickness, which normally commences at the 6th week and ends the 16th, intermittent uterine contractions at the 18th week, quickening at the 16th week, fœtal movements and fœtal heart sounds at the 24th week, and the height of the top of the uterus which, for example, is a little above the umbilicus at the 24th week.

There is not any certain indication that labour is shortly to commence, but during the last two weeks or so of pregnancy the head of the child, as a rule, sinks down a little, with the result that the diaphragm is not so incommoded and the woman breathes more easily; this is known as "lightening," and is accompanied by an increase in the frequency of micturition due to the head pressing more on the bladder, and at times by cramp in the legs, swelling in the legs and very painful hæmorrhoids.

### The First Stage of Labour.

• From the commencement of labour till the os is fully dilated.

**The Uterus.**—Labour commences by a relaxation of the cervix and lower uterine segment; this in itself starts a painful

contraction of the body of the uterus, the contractions before having been painless. Up till the relaxation of the cervix the pressure of the painless contractions of the uterus is the same in all directions, but the dilatation of the cervix leaves the lower pole of the bag of membranes unsupported, and, therefore, the pressure on the amniotic fluid in contact with that portion of the membranes which is unsupported forces down the latter and commences to separate them from the lower uterine segment and causes them to bulge a little through the external os. This separation is also assisted by the longitudinal muscles pulling up and stretching the cervix and lower uterine segment. As the membranes separate small blood-vessels between the chorion and decidua are torn, and any blood escaping trickles down through the os and washes out the plug of mucous which has filled the cervical canal during pregnancy. This discharge is known as the "show."

*False* labour pains must be distinguished from *true* labour pains. False labour pains are felt in the abdomen, are irregular, colicky and intestinal in origin. *True* labour pains are felt in the back, are regular, gradual and uterine in origin. They are accompanied by the "show," and the uterus can be felt to harden with the pain.

A marked change also takes place in the action of the muscles of the upper segment of the uterus, so that instead of retaining their former length on relaxation after a contraction, as they did during pregnancy, they remain a little thicker, or in other words, the relaxation is deficient so that a permanent shortening of the muscle fibres results. *Retraction*, as this is termed, is a very important attribute of the uterus' action in labour and is most marked in the second and third stages. Moreover, retraction only occurs in the upper uterine segment, the lower segment never getting thicker during labour but always progressively thinner. Retraction then commences in the first stage of labour, its action is not marked and is concerned with dilating the cervix.

**The Placenta and Membranes.**—The pains during labour are rhythmical, and become stronger and more frequent as it progresses until they reach the maximum as the head is being expelled. In the intervals of the pains the



uterine muscle relaxes, except that portion which is retracted. This relaxation enables the mother to obtain temporary rest, and also allows the circulation in the placenta, which was arrested during the contraction, to continue.

It has already been pointed out that when the chorion separates from the decidua a bag of membranes is formed, by the liquor amnii under pressure, forcing the chorion and amnion through the external os. A fluid wedge is thus formed, the object of which is to dilate the external os and what remains of the cervical canal, which in a primigravida at the commencement of labour is well marked. The nerve relations, between the cervix and lower uterine segment and the upper segment of the uterus, are such that the stretching of the lower segment incites the upper segment to contract. The first stage of labour proceeds, therefore, with stretching of the external os and lower segment, followed by contraction of the upper segment, and so on, until the external os is fully dilated, i.e. to a diameter of  $3\frac{1}{2}$  inches, when the pressure on the bag of membranes by the liquor amnii is sufficient to tear the amnion and chorion and the membranes are thus ruptured.

*Early Rupture of the Membranes.*—From what has been stated, it is evident that if the membranes rupture before the full dilatation of the external os labour will be prolonged, because the blunt head of the child will not fit into the external os so well as the fluid wedge of membranes; the cervix will not, therefore, be easily stretched, and consequently contraction of the upper segment will not be so efficient, a condition known as “*sluggish uterus*”. Moreover, the labour will also be prolonged because the internal os will not be so quickly dilated. This is bad for the mother, as she will be deprived of rest, and also for the child as the placental circulation will be more interfered with. The normal duration of labour in the first stage is about 18 hours in a primipara and 9 hours in a multipara.

**The Auxiliary Muscles.**—These muscles are not brought into action during the first stage of labour; their action will be described under the second stage.

**The Child.**—The child is in a position of flexion, the vertebral column being flexed, the head bent on the chest, the arms folded across the chest, the thighs bent on the abdomen,

and the legs on the thighs. It does not make any appreciable progress during the first stage.

### The Second Stage of Labour.

From full dilatation of the external os to the expulsion of the child.

**The Uterus.**—Retraction of the upper segment of the uterus now becomes much more marked, and plays the chief part in the expulsion of the child. As the upper uterine segment becomes thicker, its cavity becomes smaller, with the result that the amount of room available for the child gradually decreases, and it is thus squeezed into the lower uterine segment and vagina. Moreover, the retracted upper segment on the body of the child prevents the child being pushed back by the contraction of the vagina and pelvic floor when the uterus relaxes. Lastly, as the retraction becomes more marked additional power is gained from the increased thickness of the upper uterine segment.

The intra-uterine pressure has now another action. Whereas in the first stage of labour the pressure is exerted on the amniotic sac only, and this is known as the *general intra-uterine pressure*, on rupture of the membranes a certain amount of liquor amnii escapes which allows the uterus to contract directly on to the upper part of the child, and this is known as the *direct uterine pressure*. This latter pressure is the chief agent in expelling the child, acting, as it does, along the spine of the child on to its head. The general intra-uterine pressure, however, has still an important mission, its action now being to keep the child in the best direction for expulsion, that is in the axis of the genital canal.

**The Placenta and Membranes.**—So long as there is a sufficient amount of liquor amnii retained in the uterus above the head of the child, during the second stage of labour, the circulation through the placenta is not injuriously interfered with. In the absence of relaxation of the uterus, due to a dangerous condition known as *tonic* contraction, which may occur in the second stage if labour is obstructed, the mother becomes much exhausted and the child is in great danger of being asphyxiated through prolonged interference with the

placental circulation. In normal labour the head being driven down into the vagina acts, up to a point, especially during a pain, as a cork in a bottle, and the small amount of liquor amnii that escapes does so very slowly. The membranes are separated a little during the second stage of labour, being thrown into ridges by the retraction of the upper segment and stretching of the lower segment.

*Late Rupture of the Membranes.*—Rarely the membranes do not rupture at the end of the first stage. Labour is then prolonged because the direct uterine force is not able to act efficiently. When, therefore, the os is fully dilated, the correct treatment is to rupture the membranes if they remain whole. Moreover, the tougher amnion, in cases of late rupture, may burst through the chorion with the result that a portion of the chorion may be retained after the third stage of labour. More rarely the child is born before the amnion is torn, in which case the child is said to be born with a caul. In olden days sailors were particularly partial to cauls, regarding them as mascots, and these would fetch as much as £5.

**The Auxiliary Muscles.**—As the pains become stronger and more frequent during the second stage, and the vagina and vulva are stretched by the advancing head and by the contraction of the uterus, certain muscles of the skeleton automatically contract; the woman having fixed her pelvis by pressing her feet against the bottom of the bed, and her shoulders by pulling on a towel tied to the end of the bed, the muscles which are attached to the shoulders and pelvis are able, by their contraction, to cause greater expansion of the chest and so a deeper inspiration can be taken. This deep inspiration having been taken, the woman holds her breath, and the diaphragm thus completely depressed forms a firm surface against which the top of the uterus can rest, and so get a greater effect when it contracts; just as one can push away a heavier weight with one's back against a wall than if one is standing in the middle of the room without any such support. Further, by contracting her abdominal muscles, "bearing down" as it is termed, the woman is able to raise the intra-abdominal pressure very considerably, which itself, acting on the uterus, is an additional factor of some magnitude in expelling the child. It is true that labour can progress in the



absence of such auxiliary aid, but it is also true that labour is lengthened in those cases in which the woman cannot use her auxiliary muscles, as when, owing to disease of the heart or lungs, she is not able to hold her breath.

**The Child.**—After the membranes have ruptured, that portion of the head of the child which is lowermost, projecting through the os, or more or less free in the vagina, is not subjected to any pressure, with the result that serum escapes from the capillaries in that portion of the scalp between the skin and covering of the bone (pericranium), and a soft swelling is formed which is the first part of the child touched on vaginal examination. This swelling is known as the *caput succedaneum*.

There is no necessity here to enter into any details concerning the movements of the head of the child during its progress through the birth canal. Suffice it to say that, the head being well flexed, the occiput rotates forwards till it is facing the symphysis pubis and then slips under the pubic arch, after which the head extends and is born, followed directly by the birth of the arms folded on the chest and then of the trunk and legs.

The normal length of labour in the second stage is in a primipara 2 hours and in a multipara 15 to 30 minutes.

### The Third Stage of Labour.

From the expulsion of the child till the expulsion of the placenta and membranes.

**The Uterus.**—Directly the child has been expelled the retraction of the uterus still further increases, so that on placing the hand over the abdomen the uterus, when it is contracting, can be felt to be hard and round. The uterus then rests itself by relaxing and obtains more nourishment by allowing the circulation through it to continue, it having been already pointed out that owing to the coils in the arteries, when the uterus contracts, blood cannot enter it. In a few moments another contraction ensues and so on, the object of these contractions being to separate the placenta and afterwards to expel it with the membranes.

**The Placenta and Membranes.**—As the placenta is not an elastic body it cannot shrink. On the other hand, as the

placental site retracts it does shrink. It is obvious, therefore, that if the two surfaces (the maternal surface of the placenta and the decidual surface of the uterus at the placenta site) are not indissolubly attached to one another, and one shrinks while the other does not, they must come apart, and so the placenta is gradually separated by the shrinking of the placental site.

As the placenta is separated the mouths of the uterine sinuses become exposed, and anyone studying the subject for the first time would naturally wonder why the patient does not bleed when the placenta is separated. The answer is because the muscle in the neighbourhood of the sinuses has retracted round them and closed them, and this is the reason why every woman does not bleed to death, or almost bleed to death, after labour. In some women, for reasons which need not here be discussed, retraction of the upper segment of the uterus is absent or inefficient. The result is serious bleeding which indeed may be so great that the woman dies in a few minutes, unless properly treated. This complication is known as *post-partum hæmorrhage*.

After the placenta has been separated, the rhythmical contractions of the uterus, aided perhaps by the bearing down of the woman, expel the placenta into the vagina. As it descends the placenta drags with it the amnion and chorion, those portions of the latter which have not already been separated being peeled off the uterus by its weight.

The expulsion of the placenta and membranes from the uterus and the vagina can be effected by Nature, but it is generally accomplished by art. If the patient is left alone, sometime during the hour following delivery, stimulated by the contractions of the uterus, the woman bears down, and the placenta is expelled with its smooth foetal surface outwards followed by the inverted membranes, the amnion being outermost. Together with the placenta and membranes a small quantity of blood, and perhaps blood-clot, are expelled. The placenta, as a rule, takes 15 to 30 minutes to separate. When it has separated, even if this be 2 minutes after the birth of the child, there is no reason to wait for Nature to expel it. On the contrary, for the comfort of the mother, it is better to hasten the expulsion of the after-birth by squeezing the

top of the uterus and pushing it downwards and backwards to force the after-birth out of the uterus and then downwards and forwards to force it out of the vagina.

**The Auxiliary Muscles.**—The action of these muscles in the third stage of labour has already been explained.

**The Child.**—A few seconds after birth the child will commence to cry, or should be made to do so. This means that it has expanded its lungs and is now receiving oxygen from the air in place of the oxygen from the blood of its mother. Consequently there is no more need for the heart of the child to pump blood into the placenta to become aerated, and the flow is therefore directed by other channels to its lungs. Pulsation of the vessels in the umbilical cord will, therefore, soon cease, and when it has the umbilical cord is gently pulled upon, to straighten out any coils lying in the vagina, and then ligatured in two places, one near the umbilicus and the other close to the vulva, and the umbilical cord is then severed close to the umbilical ligatures. The fœtal end of the umbilical cord should then be wiped with an antiseptic swab to ascertain whether the ligature is preventing any escape of blood. The child is now wrapped in a clean, warm blanket and placed, for the time being, in its cot or some other suitable receptacle.

#### NURSING.—

It is assumed here, as in the description of the complications of pregnancy, that the nurse has been called to the patient urgently and that a certified midwife is not available, and that the nurse herself is not a certified midwife. The following remarks are to assist such a nurse until the services of a certified midwife, or doctor, can be procured. The training of a nurse is not complete until she has gained the certificate of the Central Midwives Board.

#### LABOUR: FIRST AND SECOND STAGE.—

**The Bed.**—The best bed is a single one, made of iron, with wire springs that do not sag in the middle. To prevent the mattress being soiled a piece of oil-cloth, or macintosh, should be spread over it which, at any rate, should be large enough to reach from the waist to the knees of the patient. On top of this a blanket and clean sheet should be arranged. In



addition to a pillow and bolster at the head of the bed, a second and somewhat smaller piece of macintosh should be placed over the sheet and allowed to hang over the side of the bed under the buttocks. Lastly a clean draw-sheet, or a labour pad which has been sterilized should be placed directly under the patient. Other sterilized articles, such as towels, sheets and a gown, can be obtained in a sealed tin from most good chemists. The patient should be covered with a sheet and blanket.

*The Nurse.*—The nurse should wear a clean washable dress and apron, and the sleeves should be rolled up or be detachable above the elbows.

The nurse should not attend a woman in labour if she has been lately nursing any infectious case, or if she has any sore places on her fingers. She must very thoroughly wash and scrub her hands and finger-nails with soap and water for at least 3 minutes, and afterwards, having rinsed off the soap in clean water, she must immerse her hands in 1 in 2000 biniodide of mercury another 3 minutes. The modern nurse generally uses india-rubber gloves, and is quite right in so doing.

*The Patient.*—The patient, if possible, should have a warm bath when labour commences, washing especially the vulva with soap and water. If the patient, because of her condition or otherwise, is unable to have a bath, the nurse should thoroughly wash the vulva with soap and water, swab this off, and then bathe the vulva with an antiseptic solution. If the hairs on the labia majora are long they should be cut.

The patient should have on a clean nightgown which can be rolled up round her waist to prevent its getting soiled, and the lower part of the body should be covered with a clean flannel petticoat.

An enema should be given, unless contra-indicated, and patient should be encouraged to pass water frequently.

The pulse-rate, temperature, the frequency of the pains and the general condition of the patient should be noted. During the first stage of labour it is better for the patient to be up and walking about, and the diet should be of a digestible and nourishing character.

*Assistance : The Patient.*—Any assistance that the nurse may be able to give is not required until the second stage of labour. At the end of the first stage of labour the patient, if she has not done so before, will take to her bed, lying on her left side as a rule. A stool may be placed at the bottom of the bed against which the patient can press her feet, and a towel may be tied to the rail at the end of the bed for the patient to pull upon, since by pressing and pulling during a pain, she will be the better able to bring her auxiliary muscles into action. The patient may obtain much relief from the nurse pressing on her back during a pain. The anus, perineum and vulva should be kept swabbed with pieces of absorbent wool wrung out of lysol or monsol 1 in 360, and a bowl of these, containing three dozen, should be placed on a chair within easy reach. When the head is distending the vulva, a firm pillow should be placed between the knees.

*The Child.*—When the head of the child has been born, the nurse must carefully wipe its eyelids, with a swab wrung out in boric acid solution (1 in 20), in a direction from its nose towards its ear, a separate swab being used for each eye.

### THIRD STAGE.—

*The Uterus.*—The patient should now be turned on her back and should be directed to draw up her legs and separate them.

The left hand of the nurse must now be placed on the abdomen over the uterus when, if the labour is normal, she will feel the uterus becoming harder and softer alternately. If the uterus remains soft, the nurse must squeeze it to encourage it to get harder, since if it remains soft there is danger of post-partum hæmorrhage.

As a rule, the uterine pains return in about 20 minutes, and the placenta and membranes are then separated from the wall of the uterus, and perhaps in a short time, aided by the bearing-down efforts of the mother, are expelled through the vulval orifice. At times as long as two hours elapse before the placenta and membranes are expelled; or the placenta may be abnormally adherent, in which case a doctor will have to remove it.

*Placenta and Membranes.*—After the placenta has been separated, the nurse cannot do any harm by squeezing the



uterus, and at the same time pushing it downwards and backwards until she feels the placenta slip out of the uterus into the vagina, and then downwards and forwards to get it out of the vagina. It is very dangerous, however, for a nurse to attempt this manœuvre before the placenta has separated (unless there is post-partum hæmorrhage), as part of the placenta only may be separated, with the result that post-partum hæmorrhage may occur.



FIG. 13.—Body of woman cut in half to show the correct position of the left hand of the nurse when expressing the placenta. Note that the thumb is in front of the uterus and the fingers behind.

The correct way to squeeze the uterus when expressing the placenta is with the thumb of the left hand in front of the uterus and the fingers at the back (Fig. 13). This is also the way to hold the uterus when squeezing it to stop post-partum hæmorrhage.

There are various ways of ascertaining whether the placenta has separated, a very important point, since in normal labour the placenta must not be expressed till it is separated.



The easiest way, for a nurse not specially trained, is for her to notice whether the vulval ligature has slipped away from the vulva, if so this will be an indication that the placenta has separated. As the placenta is expelled it should be held in the right hand, the left hand meanwhile pressing on the uterus. The membranes should not be pulled upon, but should be allowed to slip out. If the membranes do not slip out the placenta should be rotated, which will twist the membranes into a rope and then, as they will be less likely to break off short, it is permissible to pull on them gently. The nurse must keep the placenta and membranes for the doctor to examine.

*The Patient.*—After the placenta and membranes have been expelled, the vulva should be carefully swabbed, and a sterilized pad, or if this is not procurable, a pad that has been scorched in the oven, should then be applied. Any linen that is soiled should be removed and an abdominal binder adjusted. As a medical man will be in attendance, or will have been sent for, he will wish to examine the patient so as to ascertain whether the perineum, or vagina, has been torn.

The nurse must not leave the patient if the pulse-rate is above 100, if the uterus does not contract well or if there is any undue bleeding.

*The Child.*—The child should be bathed in front of the fire, but not too near, the nurse being seated on a low chair nearby, and having a macintosh apron covered by a clean flannel apron over her lap.

The first thing the nurse should do is to wipe carefully the eyes, nose and ears of the child with pieces of linen dipped in the boric acid solution, using different pieces for each.

The greasy white material covering the child is then removed with olive oil and a little soap and water. Linen, or swabs, must be used for this purpose, not a sponge. The temperature of the water in the bath should be 99° F., the soap used should be free of alkali, and the towels used to dry the child should be soft. After the child is dried it should be well dusted with a good pure powder.

The child should be bathed once a day, and the same water must never be used for its face and its body.

Unless the stump of the umbilical cord is dressed very carefully it may become septic, in which case the child may very likely die.

The cord must be kept as dry as possible. It should, therefore, be threaded through a hole in a piece of sterilized linen, turned up along the child's abdomen, and then completely covered with boric acid powder, or better still, with a powder consisting of zinc oxide 1 part and starch 3 parts. The cord and powder are then covered by turning in the piece of linen all round, after which a flannel binder should be applied and the ends stitched.

A soft diaper should then be attached to the binder and the diapers should be changed whenever they are soiled, and soda should not be used when washing them. To prevent the meconium (the discharge from the bowel for the first two days) and the fæces from irritating the buttocks, the latter should be smeared, before the diapers are applied, with a little olive oil.

The child should be dressed in warm loose clothes and then placed in its cot. In no circumstances should the nurse allow the child to sleep in its mother's bed, many children are suffocated by overlying.

## POST-PARTUM HÆMORRHAGE.

The emergency which a nurse will most likely be called upon to treat when summoned urgently to attend a confinement, is post-partum hæmorrhage. Should any other complication occur there will be, practically in all cases, sufficient time for the attendance of a doctor.

To treat this complication efficiently it is necessary to have grasped thoroughly the reason why, after the birth of the child, a woman does bleed to death and, if the loss of blood is excessive, why she is bleeding.

Retraction is a special property of the muscles of a pregnant uterus. It occurs only in the upper part of the uterus, where the placenta is normally situated and consists of a permanent and progressive shortening of the muscle fibres. In addition to its action in the first and second stages of labour, it separates the placenta and membranes in the third stage of labour, and

closes the uterine sinuses, in the placental site, as the placenta is normally separated.

Contraction of the uterus results in a temporary shortening of the muscle fibres of the uterus, or a temporary shortening of these portions of the muscle fibres which are, as in normal labour, not retracted. In addition to its action in the first and second stages of labour it expels the placenta and membranes in the third stage. It also, in this stage, owing to a special arrangement of the blood-vessels of the uterus, keeps the uterus almost entirely free of blood, so that while it is contracted but very little blood can escape from the sinuses, even if they are not closed by retraction. Why the uterus does not remain permanently contracted, after the second stage of labour, is because it has to relax to obtain more blood to nourish it.

#### CAUSE.—

1. Deficient retraction of that portion of the uterus from which the placenta has separated. As a result the uterine sinuses in the placental site are not efficiently closed and therefore blood escapes.

2. Absence of contraction of the body of the uterus. In other words, the uterine muscle is exhausted and, for the time being, is in a paralytic condition. Here again the blood is escaping from the uterine sinuses, as these remain open.

3. Laceration of some portion of the genital track, involving a large artery; as a rule in such cases when the hæmorrhage is severe it is the cervix that is torn, the uterine artery, or some large branch of it, being involved.

4. Inversion of the uterus (turning inside out).

#### TREATMENT.—

The nurse must endeavour to ascertain whether the bleeding is coming from the uterine sinuses in the placental site or from a torn vessel in the genital track.

Such a diagnosis is not difficult, since if the bleeding is from a torn vessel, the uterus will be *hard*, whereas if it is from the placental site the uterus will be *soft*. Moreover, if from a torn artery, the blood may be seen spurting from the vagina.

If the bleeding is from the placental site it is due, as already



mentioned, to deficient retraction, the absence of any contraction, or to inversion of the uterus. Inversion of the uterus is very rare. In this case the outside of the uterus cannot be felt from the abdomen, but its inside can be felt occupying the vagina, or can be seen projecting through the vulval orifice.

In the absence of a laceration, or inversion, this leaves the diagnosis of the cause between deficient retraction and the absence of any contractions. It does not matter whether this differential diagnosis is made by the nurse or not, since deficient retraction being by far the commonest cause of post-partum hæmorrhage, the nurse must treat the bleeding on this assumption. It is only when the measures to be described for treating deficient retraction have failed that the diagnosis of exhausted uterus, being the cause of the bleeding, is arrived at.

### Deficient Retraction.—

*Before the after-birth has been expelled.*—The nurse should at once vigorously squeeze the uterus which is held as depicted in Fig. 13. If the bleeding does not stop she should, by squeezing the uterus and pushing downwards and backwards, and then downwards and forwards, endeavour to expel the after-birth. If such measures fail the correct procedure is, with the left hand on the abdomen over the uterus and squeezing it, to pass the right hand up into the uterus, using the umbilical cord as a guide, and then to peel off that part of the placenta which is still attached to the uterus. After she has separated the placenta the nurse pulls it out together with the membranes. The nurse should never try to remove the after-birth by pulling on the umbilical cord, since she may invert the uterus by so doing.

When the after-birth has been removed the nurse should give a hot antiseptic douche, 120° F., and if the bleeding does not then stop she should pass the douche-nozzle into the uterus and give an intra-uterine douche.

The manual removal of the placenta is attended with great danger, since the uterus may thereby be infected. The nurse, therefore, should delay such treatment until she is certain from the dangerous bleeding that it is absolutely necessary.

*After the placenta has been expelled.*—In this case, unless the bleeding is due to the fact that the uterus is paralysed, squeezing the uterus and a hot antiseptic douche should suffice.

### Contraction Absent.—

If the measures detailed above fail to arrest the bleeding, the latter is due to the fact that the uterus, for the time being,

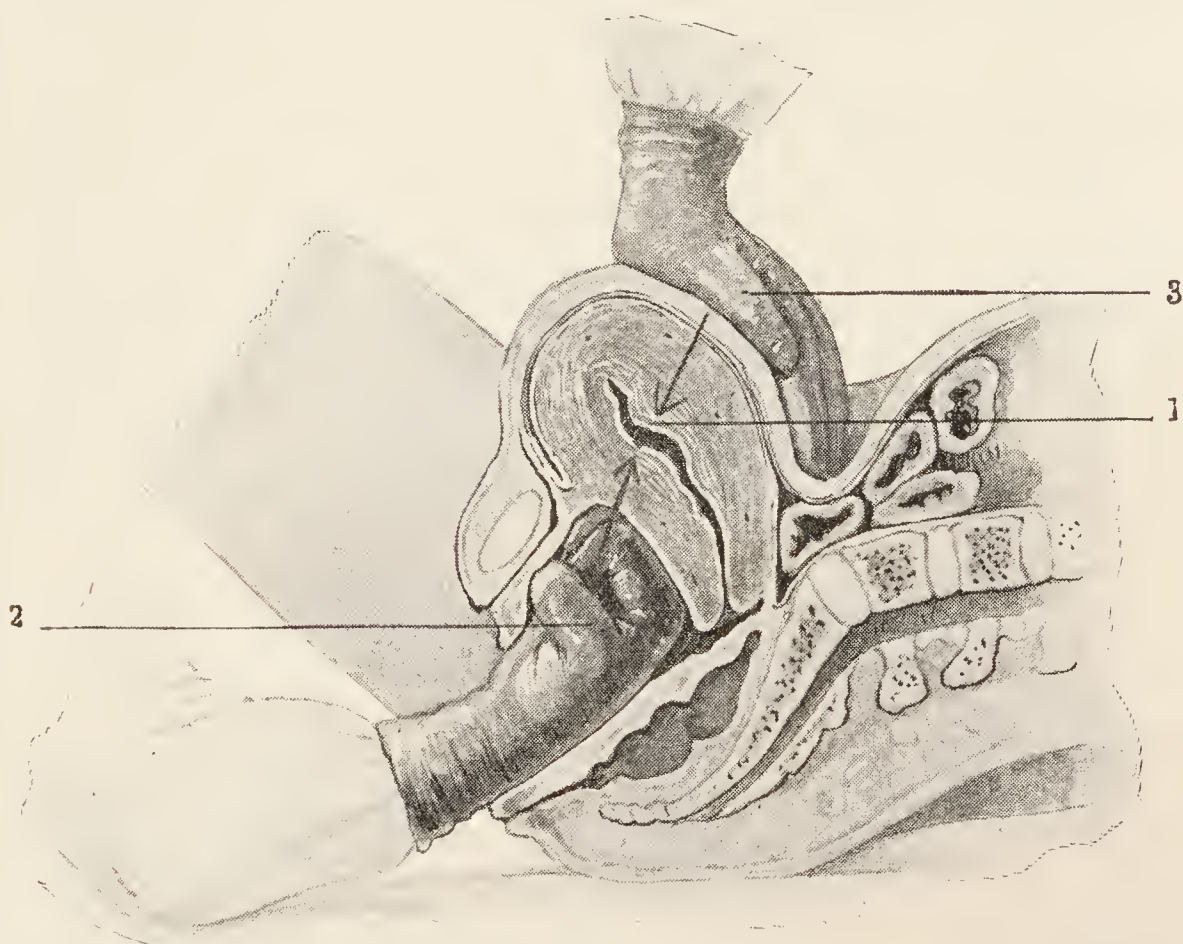


FIG. 14.—Bimanual compression. Body of the woman cut in half to show the right fist of the nurse in the vagina pressing up the anterior wall of the uterus, and the left hand of the nurse over the abdomen pressing forwards the posterior wall of the uterus. 1. Placental site ; 2. Right fist ; 3. Left hand.

is paralysed. This very dangerous condition is fortunately rare. The only thing the nurse can now do is to compress the uterus between her two hands (Fig. 14), bimanual compression as it is termed. The left hand over the abdomen presses the back of the uterus forwards, and the right fist in the vagina

and in front of the cervix, presses the front of the uterus backwards. This method stops the bleeding by bringing the inner walls of the uterine cavity close together, and if properly applied the bleeding must be arrested, there being no cavity into which blood could escape.

This method cannot without assistance be kept up for long. If, however, the nurse rests the elbow, corresponding to her internal hand, on the bed and gets some one to press upon her external hand, bimanual compression can be kept up for a long time.

### **Drug Treatment.—**

The best preparation to make the uterus contract so that the uterine sinuses are closed, is pitocin (10 units). The next best is femergin (1 ampoule or 1 tablet). This preparation does not act so quickly as the pitocin, but is far more efficient in its action than the usual preparations of ergot, which should be the last choice. The nurse should administer the drugs in this order, according to which of them she may chance to possess, or is able to obtain.

### **Lacerations.—**

A hot antiseptic douche should be given. If this fails to stop the bleeding, the nurse must pack the vagina.

### **Inversion of the Uterus.—**

In some cases of inversion of the uterus bleeding is absent, when, pending the arrival of the doctor, the nurse should apply stimulants to counteract shock, if it is present. If there is dangerous bleeding the nurse must endeavour to push the uterus back, by taking the inverted portion in her right hand, squeezing it and then pushing it upwards and backwards, removing the placenta if necessary. The uterus should be supported with the left hand on the abdomen as it is pushed back into position. After the uterus has been re-inverted, the nurse should give the patient a hot antiseptic douche.

A woman who has had post-partum hæmorrhage may be in a very precarious condition, and unless treated very carefully may yet die although the bleeding has stopped.



The nurse should, therefore, keep the patient absolutely at rest not letting her move at all. Any exertion, because of the heart being so weak, may bring on an attack of syncope and the patient may die suddenly. As so much liquid has been lost the nurse must increase the quantity in the patient's blood by giving her frequent drinks of water and rectal salines. The doctor may give a sub-cutaneous or an intra-venous saline injection or a blood transfusion. The escape of blood will have resulted in a loss of heat, and hot-water bottles, suitably protected, must be placed round the patient. Lastly, the more fresh air the patient can get the better, since she has lost so many billions of oxygen carriers. The windows should, therefore, be opened, the patient being protected from draughts.

The treatment of post-partum hæmorrhage here set out is that taught to pupil midwives. A State Registered Nurse who has not passed the examination of the Central Midwives Board, and who is summoned to a case of post-partum hæmorrhage, in an emergency, should at anyrate be able to employ some of the methods mentioned.

## PART VIII.

### SYMPTOMS ASSOCIATED WITH THE DISEASES PECULIAR TO WOMEN.

#### CHAPTER IX.

#### AMENORRHŒA.

MENSTRUATION should occur once a month between puberty and the menopause, unless the woman is pregnant, or is suckling her child. If the period fails to appear at its appointed time the condition is known as amenorrhœa. There are certain malformations of the genital organs, however, which prevent the menstrual discharge from escaping, and persons thus afflicted may appear to be suffering from amenorrhœa, although they are not; this condition is really one of *hidden menstruation*, and the symptom of supposed amenorrhœa connected therewith is therefore misleading.

For menstruation to occur there must be active ovarian tissue and endometrium. Regular menstruation depends on the ripening of the Graafian follicles, the discharge of the ovum and the formation of corpora lutea, which events lead to a hypertrophy of the endometrium. If the ovum is not fertilized the corpus luteum degenerates, and the superficial part of the endometrium necroses and is expelled from the uterus, together with a certain amount of blood mixed with secretion from the uterine glands, the composite discharge being the menstrual flow and the condition one of menstruation. Before puberty the Graafian follicles degenerate and ova are not formed. With the advent of the activity of the sex hormones, menstruation commences.

Females in whom the period does not appear can thus

be divided into two groups, that in which the menstruation is really in abeyance and that in which the cessation is only apparent.

### Real Amenorrhœa.

Real amenorrhœa may be due to some condition which is either constitutional or local.

#### CAUSES.—

##### *Constitutional.*

1. Late puberty.
2. Pregnancy.
3. Lactation.
4. Menopause.
5. Disease.

##### *Local.*

6. Congenital.
7. Disease.
8. Operation.

#### CONSTITUTIONAL.—

1. *Late Puberty.*—Menstruation starts, as a rule, about the age of 14. Nevertheless in some cases it is delayed till the girl is 17 or even older, and yet in such circumstances the individual appears to be in perfect health. Moreover, in many girls, although the first period came on at the usual time the succeeding periods appear only after an interval of a year or so. This is due to a delay in the activity of the sex hormones. Menstruation is frequently irregular both in the amount and periodicity for the first year after its commencement. It is important for nurses to remember that amenorrhœa in itself is not necessarily harmful to the individual, in fact it may be Nature's method of protecting the girl as, for instance, in cases of anæmia, when obviously the less blood that is lost the better.

2. *Pregnancy.*—A woman who is pregnant does not menstruate (see p. 24). The amenorrhœa of pregnancy is in most cases sudden; that is, up to the time of fertilization the woman usually has menstruated regularly; or, to put it another way, supposing a woman has been quite regular, and menstruation does not appear when it is due, then be she single, married, or a widow, rich or poor, or whatever her religious denomination may be, the most likely cause of her amenorrhœa is pregnancy. Rarely women become pregnant when suffering from amenorrhœa due to some constitutional



cause, and very rarely the first ovulation may result in pregnancy which results in the curious condition of a girl becoming pregnant before she has menstruated.

3. *Lactation*.—As a rule a woman does not again menstruate till she has been suckling her child for some months. In some patients the periods do not appear till two or three months after the child is weaned. The mother, however, may not finish weaning her child, as she should, at nine months because of the expense of buying milk, the trouble of preparing the food, or in the expectation that any further pregnancy can be prevented. In such cases the periods may become irregular or excessive. In other rare cases prolonged suckling may lead to atrophy of the ovaries and uterus, resulting in permanent amenorrhœa (superinvolution of the uterus). Some women menstruate regularly while nursing their children; and if the child thrives and keeps its weight, and the mother is healthy, there is no necessity for her to give up suckling.

It is not at all uncommon for women to become pregnant in whom menstruation has not reappeared since the birth of their last child.

4. *Menopause*.—The change of life usually supervenes between the ages of 45 and 50. In some women, however, even in the absence of local disease, it is delayed as late as 52, while in others, for no apparent reason, it may supervene at 35 or even earlier. The menopause is not concerned only with the cessation of menstruation, since there are other symptoms and signs (see p. 25), and especially the genital organs atrophy. The advent of the menopause is prolonged in women in whom puberty began early and shortened in those in whom puberty began late, in which case the periods are sometimes infrequent and of small amount. If the uterus is the seat of fibroids, or of chronic metritis, the menopause is often delayed.

5. *Disease*.—The commonest constitutional causes of amenorrhœa are constipation, chlorosis, and secondary anæmia. In these cases the cessation of the menstrual function takes place, as a rule, gradually—that is, the amount lost at successive periods decreases until amenorrhœa results.

Among other causes are tuberculosis, sometimes cardiac disease, the acute specific fevers, insanity, women the victims

of morphia or alcohol. Amenorrhœa also at times follows some disturbance of the nervous system. Thus the fear of pregnancy, the desire to become a mother, a sudden fright, or great grief, may result in suppression of menstruation.

LOCAL.—

6. *Congenital*.—If the uterus or ovaries are absent menstruation cannot take place. This abnormality is, however, very rare. On the other hand, there is a condition in which the uterus and ovaries do not develop at puberty, but remain, in size and shape, similar to those of an infant, and amenorrhœa results.

In a woman with an infantile uterus and ovaries the other signs of sexual maturity may be absent. In such cases the breasts remain small, the vulva and mons veneris ill-developed, and the pubic hair is very scanty. The woman may also approximate to the male type, hair appearing on the upper lip, the voice becoming harsh, and the pubic hair reaching towards the umbilicus.

7. *Disease*.—If the ovaries are both destroyed, as in cases of double ovarian tumours, or abscesses, amenorrhœa ensues. So long, however, as there is some healthy ovarian tissue left the woman may menstruate.

Of the various local diseases of the genital organs which cause amenorrhœa, ovarian tumours are the most common, but then only when both ovaries are destroyed. Regular menstruation is quite common if one ovary or part of an ovary is intact. Disease, or abnormal functioning, of the other ductless glands (thyroid, thymus, supra-renals, pituitary) may also lead to amenorrhœa.

8. *Operation*.—If the uterus is removed (hysterectomy) permanent amenorrhœa results. An operation necessitating the removal of both ovaries is followed by amenorrhœa. If, however, even a minute portion of ovary has escaped the surgeon's notice and the uterus is left, menstruation may continue.

In hospital practice it is often left to the Sister of the ward to explain to the patient that if, in the course of the proposed operation, the uterus or ovaries, or all these structures, have to be removed, the patient will be sterile, and if the uterus, or both ovaries, are removed her menstruation will also stop.

It is most important that patients should be warned of such results, otherwise, in spite of the fact that they have signed a book giving the surgeon leave to do what he thinks necessary, they may afterwards contend that they did not understand the nature of the operation, so far as its results were concerned.

### Apparent Amenorrhœa.

#### CAUSES.—

*Congenital.*—This is a rare condition in which the patency of the vaginal canal is obstructed at some spot, generally in the neighbourhood of the hymen, by a membrane stretching across it; more rarely the hymen has no orifice piercing it, rarer still some portion, or even the whole, of the vagina may be absent; and, lastly, the cervical canal may be absent.

All the causes of apparent amenorrhœa must be local, the menstrual discharge being held up by some obstruction below the level of the internal os.

#### SYMPTOMS.—

Taking the commonest cause of this condition, a septum across the lower end of the vagina, the history one obtains is very instructive.

The girl complains, once a month, of abdominal pain, backache, and the other general symptoms of menstruation.

#### SIGNS.—

In due course, if the mother is careless and delays seeking medical advice, the girl's abdomen will gradually, month by month, become more prominent. This alteration in size is due to the formation of a swelling caused by the accumulation of the menstrual fluid stretching the vagina, and pushing up the uterus (Fig. 15). In such cases, if the nurse examined the vulva of the patient, on separating the labia she would notice that the hymen was bulged forwards by a purplish swelling. Some girls are so uncomplaining, and some mothers are so ignorant, that advice is not sought until the accumulation of menstrual fluid in the vagina has become so great that the urethra is flattened by pressure, and retention of urine results.

If the obstruction is at the cervical canal the vaginal signs and those of retention of urine will not appear. In this case



the condition can be diagnosed only by a medical man, the menstrual discharge being retained in the uterus, and in many cases filling the Fallopian tubes.

*Disease.*—Inflammation of the lining of the cervical canal or vagina, leading to ulceration, may result in the opposing surfaces becoming adherent one to the other. As a result

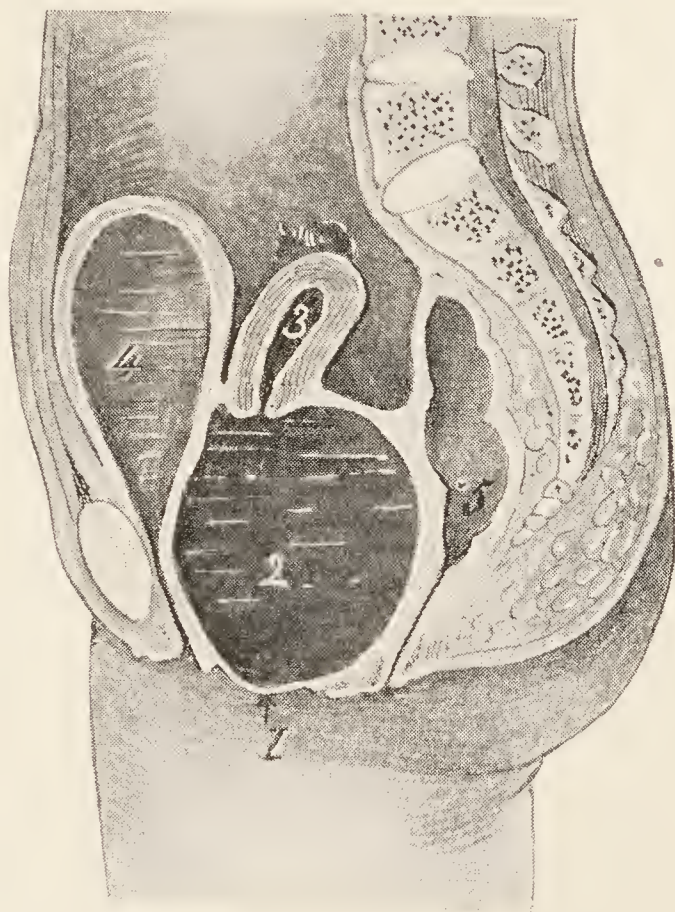


FIG. 15.—Body of woman cut in half to show the condition of apparent amenorrhœa due to the fact that the hymen, during its development, was not perforated. 1. Hymen depressed; 2. Vagina distended; 3. Uterus, cavity a little distended; 4. Distended bladder; 5. Rectum.

the respective canals, or part of them, are obliterated, the menstrual fluid being retained above the obstruction. Such inflammation may be due to one of the acute specific fevers occurring in a child, the local condition remaining unnoticed on account of the severity of the general symptoms. It may also follow injury to the vagina or cervix during labour, or an operation on these parts.

## SYMPTOMS.—

The symptoms of apparent amenorrhœa due to disease will be similar to those described under the congenital variety, except that menstruation will once have been normal, and there will be a history of some cause.

## TREATMENT.—

*Real Amenorrhœa.*—There are a large number of patent medicines advertised for the cure of real amenorrhœa, but few of these are of any value, and many are positively harmful.

The proper method of treating amenorrhœa is for the doctor first to discover the cause, if possible, by a careful examination of the patient and then to treat it.

A common cause of amenorrhœa in young girls is constipation. In the unlikely event of such a person being unable to get medical advice for some time, a nurse who recommended some preparation of iron and impressed upon the patient the absolute necessity of a daily action of the bowels would probably be rendering her a good service.

*Apparent Amenorrhœa.*—The treatment for apparent amenorrhœa is, if possible, to remove the obstruction by an operation. In the commonest condition of a septum across the vagina, or imperforate hymen, this is very easily accomplished by incising the membrane. If, however, the whole vagina, or a large portion of it, is absent, although a canal can be fashioned up to the uterus by operation, it is so difficult to prevent the raw surfaces thus made from again adhering that the uterus may have to be removed to effect a cure.

The nurse who is in charge of a patient upon whom the operation of incising the septum, or hymen, has been performed, must be most careful that the retained menstrual fluid, as it is discharged, does not remain in contact with the vulva for any length of time, since it forms the best material in which certain dangerous, but common microbes, can exist, and there is great danger that such septic microbes may infect the genital tract. The vulva, therefore, should be well swabbed with an antiseptic solution every time the diaper is changed, which should be often.

## CHAPTER X.

### BLEEDING.

(See also *Hæmorrhage*, page 224.)

THE traditional division of bleeding from the female genital tract into *menorrhagia* and *metrorrhagia* has but little to recommend it. Menorrhagia signifying an excessive loss of blood at the menstrual period, and metrorrhagia any loss between the periods, would be very suitable terms if all causes of abnormal bleeding could thus be pigeon-holed. Unfortunately, from the point of view of examinations, and more especially from that of practice, such a division will not stand criticism. The most that can be said is that an excessive loss of blood at menstruation may be due to some general cause or to some local cause, whereas bleeding between the periods must be due to some local cause.

There are many conditions which give rise both to excessive bleeding at the periods, and bleeding between the periods, and it is the knowledge of this which makes a division of the causes into menorrhagic and metrorrhagic unsatisfactory.

Whether the amount of blood lost at the menstrual period is really excessive, must in the first place be considered in relation with the usual (normal) loss of the individual. The amount lost can roughly be gauged by the number of diapers a woman uses. This will surely vary in different women apart from the amount lost, but it may be taken that if a woman of nice habits uses more than twelve diapers, the loss is generally excessive. Certainly if a history is given of having to use two diapers at once, of having to use thick Turkish towelling, absorbent wool in addition to the diaper, or of the presence of clots, the loss is excessive. On occasions young girls or women, for purposes best known to themselves



(a patient I once saw wanted to get leave off school for a term), will declare that they are losing excessively at their periods, when their general appearance and condition makes one doubtful if such is the case. An inquiry, perhaps of the mother, as to the number of diapers used may elicit the reply that she does not know, because her daughter always burns them. The amount of blood lost—apart from the clots, if any, passed during menstruation and defæcation—can be quite accurately determined by weighing the diapers before use and after use, the difference being the weight of blood lost.

The failure to remember, on the part of the doctor or nurse, that excessive loss at the periods may be due to some local disease, has been the cause of countless deaths.

#### GENERAL CAUSES.—

*Pelvic Venous Congestion.*—In the *newly married*, in women suffering from certain diseases of the *liver and kidney*, in women who intermittently indulge excessively in alcohol or harbour habitually a *loaded rectum*, pelvic congestion may be marked. Chronic alcoholism is a cause of amenorrhœa. Late hours, high living, and the modern sex novels and plays are perhaps more responsible as a cause than one realizes.

*Loss of Tone in the Muscle of the Uterus.*—In these cases the tone of the muscle is lowered so that it does not contract efficiently during menstruation and more blood escapes from the blood-vessels. Among such causes are secondary anæmia, leukæmia, pernicious anæmia, scurvy, purpura hæmorrhagica, chronic toxæmia and sepsis.

*Abnormal Action of the Endocrine Glands.*—*Myxædema* is associated with increased losses, as is also the early stage of *exophthalmic goitre*, the thyroid secretion being at fault, and although there is no proof it may be that the excessive losses occurring in some girls at *puberty*, and before the usual age of puberty, may be due to an abnormal action of the ovary or hyperactivity of the thyroid gland, and those occurring at the *menopause* may also owe their origin to some deficient working of the endocrinal glands (see p. 28).

Excessive loss at the time the menopause may be expected to ensue should always be viewed with the greatest suspicion. It is true that more women lose excessively at their periods

between the ages of 45 and 50 than at any other time of their menstrual life. *In the majority of cases, however, this loss is due to some local disease, a very common cause of which is cancer.* Nevertheless, there are numbers of women who lose excessively between the ages of 45 and 50 in whom local disease cannot be discovered and after such losses menstruation ceases for good. It is not difficult to realize, therefore, why an excessive loss, or losses, at such a time should be attributed by the laity to the menopause. The pity of it is, however, that some trained nurses, and some doctors, labour under a similar misapprehension, so that the nurse does not advise the woman to seek medical advice, and the doctor does not examine the patient *per vaginam*. This mistaken idea on the part of the laity, and on that of some nurses and doctors, is responsible for the deaths of many women every year. If those patients, in whom an efficient local examination fails to disclose any disease, are carefully questioned, it will be found that the excessive hæmorrhages are separated by intervals during which blood is not lost, and, moreover, when the bleeding does come on it is not necessarily when menstruation might have been expected; thus there may be intervals of weeks or months between the hæmorrhages. It is only in such circumstances that a diagnosis of the menopause can be advanced with any safety. In the absence of any marked intervals, the cause will surely be that of disease.

*Prolonged Nursing.*—Some women to save trouble or the cost of buying milk may continue to nurse their children well into the second year following their last labour, and again under the mistaken idea that pregnancy may thereby be prevented. In such cases the periods may become excessive, which is not only bad for the health of the woman, but also for that of the child, who will be deprived of the proper quantities of the essential constituents of food necessary for its health and growth.

*Change of Climate.*—Excessive menstruation is a common experience for women leaving a temperate climate when they go to a hot climate.

#### LOCAL CAUSES.—

The local causes of bleeding in women, which may increase the loss at the periods and are responsible for a loss

between the periods, are many. The causes are better detailed under the headings of the various genital organs:—

*Ovaries.*—Although ovarian tumours, as a rule, do not interfere with menstruation until the health of the patient is very deteriorated when, as a rule, amenorrhœa results, there are certain tumours which are associated at times with excessive uterine hæmorrhage. These are malignant and dermoid tumours.

*Fallopian Tubes.*—*Malignant disease of the Fallopian tubes* is a very rare cause of bleeding, the cherry-coloured blood escaping into the uterus and then being discharged.

*Uterus.*—Innocent tumours such as *fibroids*, *mucous polypi*, *adenomyoma*, and malignant tumours such as *carcinoma*, *sarcoma*, and *chorion-carcinoma*. Inflammations of the endometrium such as *acute endometritis*, and of the muscle of the uterus as in *chronic metritis* (fibrosis).

*Ulceration of the cervix* due to carcinoma, sarcoma, syphilis, tubercle, to an ill-fitting or neglected pessary, or to some other foreign body, may be the cause of the bleeding, as also may chronic inversion and subinvolution.

*Vulva.*—*Carcinoma*, *sarcoma*, *injury*, or ruptured *varicose veins*, and *syphilitic ulceration*, *cancer of the urethra*, and rarely an *urethral caruncle* may be the cause.

This is an exhaustive list and may not be of much value to the nurse as such. It is very important, however, that a nurse should have some idea of the most likely causes of abnormal bleeding, and since she has not had a medical training, and it is not her business to examine women, the diagnosis so far as a nurse is concerned can best be set out as in the section on “Discharges,” under which are the most likely causes at various ages.

*From Infancy to Puberty.*—In the first few weeks of life a female child may have a slight bleeding from the genital tract—the cause is not known. Somewhat later in early childhood there are two conditions that cause bleeding and are very serious and practically always fatal, sarcoma of the cervix and malignant ovarian tumours; a third, which is not serious, is known as precocious menstruation; it is a rare condition, and the first two causes are far more likely than the third.



*From Puberty to Marriage.*—The common causes here are the profuse losses at the onset of menstruation, and some of the causes of venous congestion of the pelvic veins ; more rarely sarcoma of the uterus and malignant ovarian tumours.

*From Marriage to the Menopause.*—Again, in the early years such results of labour, or miscarriage, as subinvolution and infection are the commonest causes, and then infection from other causes. As the patient gets older, fibroid tumours of the uterus, chronic metritis and cancer are the chief causes, and at the menopause the excessive losses with no detectable cause.

*After the Menopause.*—By far the most likely cause, at and after the menopause of a more or less continuous loss, is cancer in some portion of the genital organs. Other causes less common being mucous polypi, senile endometritis, degenerated fibroids and simple ovarian tumours.

There are two lessons to be learned from a perusal of the foregoing. The first is never to regard an excessive loss, or irregular loss, at or about the menopause, as natural. This way disaster lies. Every woman complaining of such a symptom must be examined internally so that cancer in its early stages may be discovered if it is present. If she refuses such an examination the doctor should decline to treat her. There can be no exception to such a statement, it is an aphorism.

The second lesson is that bleeding between the periods, for all practical purposes, must be due to some local cause. This being granted, it follows that any woman with such a symptom should be carefully examined by a medical man, which examination should include a bimanual palpation, unless in single women it is obvious from an abdominal vulval or rectal examination that there is a tumour which is the cause of her symptoms.

#### TREATMENT.—

The treatment of excessive, or abnormal, bleeding is the province of the doctor, and a short account of that usually followed will be found under the headings of the respective diseases described in this handbook.

#### NURSE'S TREATMENT.—

The treatment by the nurse consists, for the most part, in giving the correct advice if her opinion is asked. From what

has already been said, it is obvious that an intelligent nurse, in such circumstances would, if she had ascertained that the periods were excessive or that there was bleeding between them, insist, as far as she could, on the woman or child having the advice of a doctor. More than this, I think it is quite fair to say that if a woman over 40 years of age has been sent by a nurse to consult a doctor for excessive hæmorrhage and he has not examined the patient internally at the first or second interview, the patient should insist on his doing so, or the nurse should advise her to change her doctor.

For the rest, the nurse's assistance is likely to be sought only when there is serious bleeding going on, and the services of a doctor cannot be obtained within a reasonable time.

## CHAPTER XI.

### PAIN.

THE following varieties of pain will be discussed : dysmenorrhœa, intermenstrual pain, abdominal pain, backache, pelvic pain and dyspareunia.

#### Dysmenorrhœa.

Dysmenorrhœa signifies painful menstruation, but it is customary to apply this term also to pain in the genital region during the week before the flow appears.

The number of females *per* hundred who suffer from dysmenorrhœa varies according to their age and to their behaviour during the menstrual period. A careful investigation, by women doctors, into the subject of dysmenorrhœa among girls and young women in schools and colleges showed that in 78 per cent. menstruation was painless. In the remaining 22 per cent., slight discomfort was felt in 17 per cent., the pain was sub-acute in 2 per cent., and disabling in 3 per cent.

These figures are a great advance on those of former investigators, who reported that 70 per cent. of women complained of some pain, or discomfort, during or just before menstruation, and that in 10 per cent. of these women the pain was severe enough to interfere with their usual vocation.

The reason for this discrepancy is to be found in the fact that school girls and young women are now taught to regard menstruation as a perfectly normal function, which should not be allowed, unless it becomes abnormal, to interfere with their usual customs or activities.

In the past the menstrual period was regarded by many mothers, school mistresses, and doctors as a time of semi-invalidism, and rest in the recumbent position, the application



of hot-water bottles to the abdomen and the use of drugs, when there was the slightest discomfort, advocated.

Such treatment, in most cases, merely encouraged dysmenorrhœa to develop, and by the time the girls arrived at womanhood 70 per cent. complained of pain or discomfort.

If the modern rules of hygiene of the menstrual period are carried out, there is no doubt that the incidence of dysmenorrhœa can be markedly diminished. Moreover, apart from the pain and discomfort, the aggregate amount of time lost by women workers, because of dysmenorrhœa, is enormous.

It is a common observation that, as a rule, those women who complain the most of dysmenorrhœa have the least to think about, and conversely the pain is more easily tolerated by those who have to earn their own living.

Dysmenorrhœa may be divided into three classes :—

1. That in which the pain is intermittent and colicky in nature.

2. That in which the pain is continuous and dull-aching in character.

3. That in which, with a dull-aching pain, there are intermittent periods of sharp intensity. This class is a combination of the first two.

Moreover, in each of these three classes there may, or may not, be some local disease to account for the pain.

1. **Colicky Dysmenorrhœa.**—*Local Disease Present.*—The cause of the painful contractions of the uterus is due to some substance which it is endeavouring to expel, either blood-clot, mucous membrane, or a tumour.

When the flow is excessive, or when the cervical canal is narrowed, the blood does not escape so freely as it usually does and clots are, therefore, formed. The contractions of the uterus to expel these clots must necessarily be stronger than in normal menstruation when there are no clots. This increased effort of the uterus results in severe pain resembling colic, which lasts until the blood-clot is expelled. Any disease, therefore, in which menorrhagia is a symptom, or in which the cervical canal is narrowed by atresia of the cervix or obstructed by a polypus, cancer, or fibroid, may give rise to colicky dysmenorrhœa.

A reference to the description of normal menstruation will

remind the reader that the superficial part of the mucous membrane of the uterus is broken up by the blood, which has escaped from the capillaries breaking up the membrane into small pieces. In the disease known as *membranous dysmenorrhœa* there is an extravasation of blood into the deeper layers of the mucous membrane, so that large pieces of the superficial layer, or even the whole superficial layer, (in which case there will be discharged a cast of the uterus) are stripped off. To expel these large pieces the uterus has to contract strongly, hence the pain.

Membranous dysmenorrhœa may have been present since the girl first menstruated, in which case the cause is unknown, or it may occur after several years as the result of septic infection of the endometrium following childbirth or otherwise.

Lastly the presence of a submucous fibroid or polypus in the uterus impels this organ to contract vigorously in its endeavour to expel it, and these contractions are especially marked during menstruation.

*Local Disease Absent.*—In the majority of cases in nulliparous women an adequate cause cannot be found for the uterine colic, and the condition is then known as *spasmodic dysmenorrhœa*. The pain in these cases has been thought to be due to a neurosis, but it is often present in women in whom such a diagnosis could not be entertained. In many cases the shape of the uterus has not changed with puberty, and corresponds to that found in the infant, so that its body is markedly anteflexed, and its cervix has a pin-hole os and is conical in shape. It has been thought, therefore, that the pain may be due to this peculiarity, but such a shape is found very well marked in women with painless menstruation. It may be that some cases are due to a neurosis and others to a maldevelopment.

**2. Congestive Dysmenorrhœa.**—In all women the genital organs become congested during the week preceding the period as a result of the extra amount of blood which flows to them at that time. This blood is accommodated by the genital organs becoming somewhat stretched or distended, and so long as they are not the seat of any disease this congestion causes but little discomfort in most women.

*Local Disease Present.*—When the internal genital organs

of a woman are in a state of chronic congestion, or are inflamed, such as in cases of endometritis, salpingitis, pelvic peritonitis or pelvic cellulitis, or when tumours are present in the uterus, such as fibroids, adenomyoma, and cancer, or in some cases when there is a backward displacement of this organ, the additional amount of blood causes increased pressure on the nerves of these organs and pain results. If, moreover, the uterus, ovaries, or Fallopian tubes are bound down by adhesions, and unable to become distended or stretched with the congestion, the pain is worse. Another definite cause of dysmenorrhœa are the "chocolate cysts" of the ovary.

*Local Disease Absent.*—Congestive dysmenorrhœa, in the absence of local disease, does occur in young people. It is impossible satisfactorily to account for the cause of the pain. It is probably due to the custom, in the past, of treating girls as semi-invalids while they were "unwell." The curtailing of exercise, the provision of hot-water bottles, and so forth, merely increasing the normal congestion at this time.

3. **Colicky and Congestive.**—Many women who suffer from colicky dysmenorrhœa acquire, as time goes on, the congestive variety in addition. There is no need to discuss this third variety separately since its symptoms and signs are a combination of the first and second.

#### SYMPTOMS.—

The pain associated with colicky dysmenorrhœa is intermittent and continues till the blood-clots, or membrane, are expelled. The pain in a typical case of *spasmodic dysmenorrhœa* appears a few hours before the menstrual flow commences and lasts, as a rule, not longer than twenty-four hours. It is of a spasmodic character, although this is not necessarily so. In many instances menstruation for the first two or three years is painless, or only causes slight discomfort, though at times the pain is present from the commencement. Spasmodic dysmenorrhœa is the commonest form of dysmenorrhœa in young women, and also the most painful, so that the patient may vomit, perspire, or even faint. The flow does not become fully established until the pain ceases. As time goes on, if the condition is not cured, there is a tendency for the supervention of the congestive type so that the pain becomes more continuous and may last much longer.



From what has been said, as to the cause of congestive dysmenorrhœa, it might be supposed that the pain would appear sometimes before the menstrual flow and decrease as the period continued. This, as a fact, is the case, the pain, which is of a dull-aching character, commencing perhaps five or six days before and disappearing or being relieved towards the end of the period.

TREATMENT.—

The proper method of treating dysmenorrhœa is to ascertain, if possible, the cause, which may necessitate a pelvic examination, and then to treat it. A nurse cannot from her training be expected to arrive at such a diagnosis.

Patients suffering from spasmodic dysmenorrhœa are successfully treated by attention to the general health, many of the girls being anæmic and constipated and perhaps not taking sufficient exercise, and in such cases an internal examination is not necessary. If such measures fail, dilatation of the cervix will, in most cases, effect a cure, or at any rate greatly relieve the pain. The operation has this additional advantage, that if sterility, in addition, is complained of, such an operation will, in a certain percentage of cases, cure also the sterility.

The most usual drugs prescribed by the doctor are those of the coal-tar series, antipyrin, antikamnia, aspirin, ammonol, phenacetin or pyramidon.

NURSING.—

The nurse may be of the greatest assistance in giving advice on the preventive treatment of dysmenorrhœa.

The following copy of the leaflet, issued by the authority of the Council of the Medical Officers of Schools Associations, will give the nurse an idea on what lines her advice should be given. The carrying out of these Rules has reduced the incidence of dysmenorrhœa in Schools and Colleges to a very marked extent :—

*“ Advice to Girls Concerning their Monthly Period.*

“ 1. The monthly period is not a malady but a natural function ; you ought, therefore, at these times to feel quite well and to be free from pain or any unpleasant sensations.

“ 2. The ordinary rules of cleanliness and hygiene should be observed as at other times. There is no risk in the use of soap and water, in spite of the usual prejudice against it ; a warm bath should, if possible, be taken every day throughout the period ; if this is not possible, you should wash the whole body, including the feet, with soap and water. There should be a daily action of the bowels, as at other times.

“ 3. In order to grow up strong and well, it is necessary that you should have some exercise every day in the open air, such as a brisk walk or games. It is important that you should continue this exercise, as usual, throughout the period, as, by so doing, you will probably prevent the onset of monthly discomfort and pains later on. If you are troubled with slight headache or backache, or a sense of fatigue, or slight pain during the period, you should take a brisk walk or play games, or do some work in the house or garden, involving bending movements of the body. If you give up all exercise, more especially if you lie down, your aches and pains will be prolonged and increased in severity.

“ 4. If you feel ill at the period and are not able to carry on your usual occupation, your doctor should be consulted. Any ailments associated with the period are more easily cured while you are young than after they have been established for years.”

The treatment of dysmenorrhœa by opium, or hot gin and water, is absolutely to be condemned. The life of many a young girl has been ruined from the habit thus acquired, especially when opium or its derivatives have been taken. Nurses particularly should be careful about this. It is a fact that in many of these cases the victim was, in the first instance, advised to take the opium by a nurse, or the nurse herself acquired the habit during her hospital training, more especially as in these circumstances it is a comparatively easy matter to get possession of this drug. The “ Dangerous Drug Act ” has reduced materially the number of such victims.

If the advice of a doctor cannot for the moment be obtained, there is no harm in the nurse advising small doses of aspirin, antipyrin, hot ginger and water, or sal volatile in cases of colicky dysmenorrhœa not associated with the discharge of clots or a

membrane. A hot-water bottle applied to the vulva, in which situation it gives far greater relief, if any, than if applied to the abdomen, and rest may be tried.

Congestive dysmenorrhœa in many cases is relieved by rest, warmth and saline aperients.

The doctor may wish to ascertain whether his patient is suffering from membranous dysmenorrhœa. In this case he will direct the nurse to save "everything that is passed," to enclose it in muslin and then to wash it in relays of water. The blood and blood-clots will thus be disposed of, and any membrane present will be retained in the muslin for future examination.

If the dysmenorrhœa is really so bad that it cannot be controlled by the usual drugs, or by such a simple operation as dilatation of the cervix, and it is entirely preventing the woman following her usual occupation, some doctors, as a temporary relief, will order an opium suppository without enlightening the patient, but the only proper treatment in such cases is to stop menstruation for good. It need hardly be added that such a method of relief is only very rarely sanctioned by the doctor.

### Intermenstrual Pain.

This is a condition in which women complain of pain, more or less severe, occurring quite regularly between the periods. This pain has no particular relation to menstruation either as regards its quantity or to the presence of any dysmenorrhœa. It is a fact, however, that of those who complain of this "middle pain" a majority, perhaps, suffer from dysmenorrhœa and some increase in loss. Again intermenstrual pain is more often a source of complaint by women who have had children. These two facts suggest that the pain may be due to some abnormal action of the ovary due to adhesions, or to inflammation following infection, and indeed one theory is that the pain is due to the fact that the covering of the Graafian follicle (see p. 20) is much tougher, and therefore ovulation is accompanied by severe pain. The other theory is that the pain is due to the stretching of the Fallopian tube by secretion, the abdominal ostium being closed by a few adhesions, the pain



disappearing when the retained fluid escapes into the uterus. Both these theories as to causation may be correct since, not infrequently, the outer covering of the ovary is found to be very thick or to be covered with dense adhesions, or the Fallopian tube is found to be dilated (Hydrosalpinx).

#### TREATMENT.—

Patients complaining of intermenstrual pain should be examined by a doctor who, if any local cause is discovered, will be able to recommend the appropriate treatment.

### Abdominal Pain.

The symptom of abdominal pain is far too wide a subject to be discussed at all fully, in such a book as this, arising as it does from so many causes, medical, surgical, gynæcological and obstetrical.

There are three varieties of pain which may have some reference to the genital organs; they are acute, chronic and colicky.

#### Acute Pain.—

A sudden and really acute attack of abdominal pain in a woman is perhaps more frequently due to a ruptured tubal gestation, or tubal abortion, than any other cause. A very distinctive situation for the pain in such circumstances is in the shoulders and this disappears when the patient sits up. The pain is due to the irritation of the blood as it touches the diaphragm. An acute abdominal pain during labour is associated with tonic contraction of the uterus and concealed accidental hæmorrhage. An acute abdominal pain in the loins in a pregnant woman may be due to pyelitis or pyelonephritis. This pain, which may be very intense, is accompanied by marked tenderness in the loin, and if on the right side it is often mistaken for appendicitis, or more rarely for biliary colic. Other causes such as acute pyosalpinx must be borne in mind. Again an epigastric pain, probably due to involvement of the liver, is complained of by pregnant women who are in danger of having an attack of eclampsia, and a fibroid of the pregnant uterus may undergo red degeneration and be the seat of pain. Following labour, general peritonitis,

pelvic peritonitis and pelvic cellulitis may give rise to severe pain, and lastly during, or apart from, pregnancy an ovarian tumour may undergo torsion causing great pain, as more rarely may a pedunculated sub-peritoneal fibroid. Infection of an ovarian cyst may also be mentioned as cause of abdominal pain.

### Chronic Pain.—

The detection of the cause of a chronic pain or aching may be difficult. In the first place one has to "size up" the patient, as it were. Women will walk into the outpatient or doctor's consulting room and state that they are suffering "frightfully" and that the pain is "agonizing," "terrible," or "something shocking," and that they are "unable to stand any more." Their looks belie them. A similar type of woman, in other circumstances, will tell one that she has vomited every meal for the last two weeks and yet she looks fairly well nourished. As a general rule the woman who describes her pains so graphically is also most intolerant of an internal examination, so that although the greatest care is used she will resist, cry out and declare that any movement of the uterus, or palpation of the vagina and its fornices, causes intense and intolerable pain. In but a very few of these cases can any cause for the pain be found. The victims are often run down, more or less anæmic, have usually too much work to do and get too little rest and perhaps no holidays, while their diet may be insufficient or inappropriate; they are suffering from neurasthenia.

A dull-aching pain is associated with pelvic inflammation, and if, in addition, there is a history of repeated and acute attacks of abdominal pain lasting a day or two, such a diagnosis is almost certain, the acute attacks signifying a further involvement of the pelvic peritoneum. The pain of pelvic inflammation is relieved by lying down. Tumours of the pelvic organs, both innocent and malignant, do not, as a rule, cause pain except as the result of their pressure, unless if innocent they have become infected or bleeding has taken place into them, or if malignant the growth has extended beyond the tumour. The pain of malignant disease is not relieved by rest and is worse at night. Fibroid tumours of

the uterus are painless, and if, therefore, a patient with such a tumour complains of pain, or tenderness, or both, this signifies, as a rule, either that the tumour has undergone degeneration, or that cancer has become engrafted upon it. An over-full bladder from retention of urine is a source of extreme discomfort if not of real pain. A favourite diagnosis of the cause of pain in one or other iliac regions is that of "ovarian trouble." The only "ovarian" indication about it in many of the cases is that the pain is felt over the ovarian region. If the patient is submitted to operation it is very rare to find the ovaries diseased. It takes a long time to convince those women who imagine that their pain is ovarian in origin, or have been told so, if one can ever do so, that the pain is not due to this source. Such a pain is perhaps most often due to a loaded cæcum or sigmoid, and is mostly cured by Epsom salts.

### **Colicky Pain.—**

Intermittent abdominal pain of a severe nature is connected in gynæcological practice with threatened or inevitable miscarriage, extra-uterine gestation, or with the efforts of the uterus to expel a submucous fibroid or a fibroid polypus. In all these conditions there is also some uterine bleeding.

The colicky pain of dysmenorrhœa has already been dealt with.

### **Backache and Pelvic Pain.**

This variety of pain, which is of a bearing down and aching character, is generally attributed, and not necessarily by the laity, to some abnormal condition of the genital organs. This may be quite a mistake and not infrequently leads to various methods of treatment, such as tampons, pessaries, massage and electricity which do no good and lead only to disappointment. It may be confidently stated that, as a rule, backache is not due to any abnormal condition of the genital organs. It is true that prolapse of the uterus does give rise to a bearing down pain and backache which is relieved by rest and by proper treatment. On the other hand, backward displacement of the uterus, which is always being blamed for backache, does not cause the least discomfort unless there is some other



condition, such as a fibroid, subinvolution, pelvic inflammation, marked congestion or prolapsed ovaries superadded. If an ovary gets imprisoned below the retroverted uterus it will cause a dull-aching backache, and some women with very bad constipation complain also of a similar pain, but more on the left side. As in such cases regulation of the bowels cures the pain it may be that the latter is due to pressure of the loaded rectum on the ovary. Malignant disease of the uterus and chronic pelvic inflammation may be the source of backache.

It is true that backache on rare occasions is due to some perfectly obvious, and at times very serious, disease. Example of this are spinal causes, such as malignant disease of the spine, osteo-arthritis, lateral curvature, tumours of the spinal cord and so on. There are, however, two causes of backache which may be more fully described, namely, fatigue backache and strain of the sacro-iliac joint.

*Fatigue Backache.*—This is due to muscular and nervous fatigue. It is of a dull-aching character and is made worse by exercise. This variety is found in women who have to stand or sit for many hours, the latter perhaps in the faulty position of bending over desks. In those women who have to carry heavy weights and in those who have to use the muscles of their spine continually to maintain a correct position, as obtains in the later months of pregnancy, and in many women who wear high-heeled boots fatigue backache may be the cause. It often happens that, in addition to the faulty position, the victims of fatigue backache are “run down” and anæmic.

*Strain of the Sacro-Iliac Joint.*—This is a cause of backache which often remains unrecognized. The pain, which is worse at night and after exertion, is elicited on first flexing the thigh and then extending the leg and on moving the joint by grasping the iliac bones. A firm bandage round the pelvis will relieve the pain.

### Coccygodynia.

Pain in the coccyx is due to neurasthenia or traumatism. The neurasthenic woman will fancy that there is something wrong with the “bottom of her spine” and will complain of

intense pain in sitting down. A local examination fails to disclose any local affection. Traumatic coccygodynia following a blow, fall or difficult labour resulting in fracture of the coccyx is easy to diagnose. There is severe pain when the coccyx is moved and the coccyx is found to be fractured, and the history of some injury will complete the diagnosis.

### Dyspareunia.

Dyspareunia signifies pain, or difficulty, in sexual congress. If the hymen is rigid and unruptured, if the cervix is abnormally long, reaching in some cases even so far as the vulval orifice, if the uterus is prolapsed so that the cervix fills the vaginal orifice, if the vulval orifice is too small, or there is marked disproportion between the male and female, difficulty, and perhaps impossibility, will result from purely mechanical reasons.

If, on the other hand, the hymen having been torn has become inflamed, if there is a sensitive urethral caruncle, if there is a retroflexed uterus which is tender on being touched, if the ovaries are prolapsed, or there are present in the pelvis diseased Fallopian tubes or peritonitis, or if there are any ulcers or fissures in the neighbourhood of the vaginal orifice then, although there is no mechanical obstruction, the pain elicited during the act is such that it cannot be accomplished.

The other causes of dyspareunia can be more fully discussed under the subject of sterility.

### DIAGNOSIS AND TREATMENT OF PAIN.—

The diagnosis and treatment of the pains discussed, and in their various aspects, are subjects for the medical practitioner. Nurses, may, however, be expected never to forget that a very acute abdominal pain accompanied by a little loss is a common occurrence in extra-uterine gestation, and that a backache is most unlikely to be due to disease of the genital organs ; while the midwife who did not think of tonic contraction or rupture of the uterus, or of concealed accidental hæmorrhage, if a woman in labour complained of intense abdominal pain, should seek some other sphere for her activities. Not that any well-trained midwife would be likely to wait for the advent of pain before diagnosing the likelihood, or certainty, of such complications.

## CHAPTER XII.

### STERILITY.

THE causes of barrenness in women can often be determined, and often cannot be determined. With regard to the latter, it is common knowledge that a marriage may prove sterile, and yet if the husband and wife are divorced and again marry the new unions may be fertile. It is obvious that in the case of the first marriage the spermatozoa and ova were not suited to each other, whereas in that of the second marriage they were suited. It is not possible to carry the matter farther than this, but with such knowledge the breeders of horses, cows, and other animals are, in many cases, able successfully to combat sterility in their stock by changing the sire.

The causes that can be determined are either associated with the male or with the female.

#### Male Sterility.

Sterility in the male may be due to—

1. Disease or removal of the testes.
2. Some condition of the urethra which prevents the semen being deposited in the vagina, such as a stricture or hypospadias.
3. The spermatozoa being dead, malformed or absent.
4. The mechanism of emission being imperfect; the man may be incompetent.

Sterility in the male is more common than is generally recognized, some authorities stating that in at least 20 per cent. of sterile marriages the disability is on the side of the husband. Such knowledge is of great importance, for it is not an uncommon occurrence for a woman to be operated upon for sterility without any investigation being made with



respect to her husband. Needless to say, a woman should not be subjected to any operation, having for its object the cure of sterility, until it has been ascertained that her husband is competent and that his spermatozoa are alive and well formed.

### Female Sterility.

The causes of sterility in the female may be divided into two groups, absolute and relative.

**Absolute Sterility.**—A woman cannot conceive in the absence of her ovaries, Fallopian tubes, uterus or vagina, either from malformation, operation or disease.

**Relative Sterility.**—This group comprises the majority of cases of barrenness in the female. By relative sterility is meant some condition interfering with the progress of the spermatozoon to the oocyte, or which diminishes the vitality of the spermatozoa, or interferes with the implantation and growth of the zygote.

This group can further be divided into two classes; the one in which some physical signs, indicating defect in the sexual organs, can be found, the other in which the latter appear to be normal.

**Physical Defect Present.**—Included in this class will be found disease of the Fallopian tubes, of the ovaries, of the uterus, and of the vagina, more particularly salpingitis, endometritis, chronic cervicitis, and vaginitis. Many women afflicted with a backward displacement of the uterus, or with a submucous fibroid, do not conceive until the uterus has been replaced or the fibroid removed. On the other hand, it must be admitted that a vast number of women, so circumstanced, have no difficulty in conceiving and give birth to healthy children. Dyspareunia may be a cause of sterility.

The administration of radium, or radon, to the uterus and of X-rays to the ovaries will nearly always result in sterility.

**Physical Defect Absent.**—Although a most careful examination may fail to discover any physical defect in the sexual organs, nevertheless a reference to the discussion on female sex hormones (see p. 28) will indicate how these may be the cause of sterility. There are certain symptoms associated with the sterility in this class which in some cases appear to have

a distinct bearing on the disability. These are spasmodic dysmenorrhœa, vaginismus, deficiency of the sex-sense, and profluvium semenis.

*Spasmodic Dysmenorrhœa* is not uncommonly associated with sterility. It certainly is a fact that the operation of dilatation of the cervical canal, undertaken to cure the dysmenorrhœa, in many cases also cures the sterility, and even in the absence of menstrual pain such a dilatation not infrequently leads to conception. It is difficult to understand why this should be since the cervix may appear to be perfectly normal, and however small its canal, short of complete obstruction, it is always sufficiently large to allow of the easy passage of spermatozoa.

*Vaginismus*.—A spasmodic reflex contraction of the levatores ani may be purely of nervous origin, but the pain and distress of attempted coitus may be so great that penetration is impossible. Division of these muscles will usually cure the complaint.

*Deficiency of the Sex-sense* is quite common in women who are sterile. It may be that in such cases the sex hormones do not function normally. Its presence, however, is not essential to conception, since women have become pregnant as the result of brutal rape, or after connexion while unconscious. There are many instances on record, nevertheless, in which the only time the woman conceived was when she had her first and only orgasm.

*Profluvium Seminis*, or expulsion of the semen from the vagina immediately following coitus, occurs in a large number of women who are sterile. It is also a well-known phenomenon in sterile mares, and in the latter can at times be cured by injecting the semen directly into the uterus. In view of the millions of spermatozoa that are deposited in the vagina, it would seem impossible that all should be expelled, and the oocyte requires only one spermatozoon to fertilize it. The fact, however, that Nature provides such a vast number of spermatozoa to be available for the fertilization of one oocyte, rather points to the fact that it is not so easy for an oocyte to be fertilized as might be thought, and that, therefore, by the expulsion of a large portion of the semen the chances of fertilization become correspondingly lessened.

**TREATMENT.—**

The nurse will not be called upon often to advise as to the treatment of sterility, since the treatment is based, so far as possible, on the cause, and this the doctor will have to determine.

Those cases of sterility in which an abnormality cannot be discovered, either in the husband or wife, are sometimes cured by certain procedures. The most common of these is dilatation of the cervix, with or without curetting. Some authorities advocate the latter, believing that a new endometrium may favour the implantation of a fertilized ovum, this on the assumption that the cause of sterility is the failure of implantation, or as the medical student more tersely put it in his final examination, “a new tenant prefers a new wall paper.” It is not known in what percentage of cases such a treatment is successful, but every gynæcologist has had many successes after dilatation of the cervix—and many failures. From this it is obvious that if the opinion of the nurse was sought, as it not infrequently is, her answer would be that it is most certainly worth trying. Another method of treatment, in similar circumstances, is that of enlarging permanently, by a plastic operation, the external os and cervical canal (Pozzi's operation).

Other methods of treatment, about which nurses may be supposed to know something, are the inflation of the Fallopian tubes with carbon-dioxide gas or air, and the injection into the Fallopian tubes of an oily solution of iodine known as lipiodol.

**Inflation of the Fallopian Tubes.—**

This method was originally devised as a means of ascertaining whether the Fallopian tubes (one or both) were patent. It is obvious that if the Fallopian tubes are blocked, as the result of infection, the oocyte cannot get into the tube to be fertilized. With a special instrument, which was devised by Rubin, carbon-dioxide gas is injected into the uterus and, certain precautions having been taken to prevent its leakage back into the vagina, it must, therefore, escape into the peritoneal cavity, or distend the Fallopian tubes.

Which of these two events is happening is determined by hearing the gas escaping into the peritoneal cavity when the ear



or a stethoscope is applied to the abdomen, and also by an instrument called a manometer, attached to the bottle which is delivering the gas into the inflation tube. This manometer registers the pressure of the gas in the bottle and in the uterus and tubes. If the Fallopian tubes are patent the needle on the manometer rises steadily till it suddenly stops and commences to fall which is an indication that the gas is entering the peritoneal cavity. The pressure before this occurs varies from 40 mm. up to 200 mm. of mercury, as a rule somewhere about 120. Pressures higher than 200, and even with 200 if the needle sinks very slowly, show that there is partial or absolute obstruction. The disadvantage of this method is that, although it may determine the presence of an obstruction, there is no indication as to where the obstruction is. It is important that this should be known, since most authorities are agreed that it is not worth while submitting the patient to an operation if the obstruction is near the uterine end of the tube or in the isthmus; on the other hand, if the obstruction is at the ampullary end, an operation may be well worth performing. When this method of inflation had been in use for some time it was discovered that a certain number of sterile women became pregnant after inflation, although their Fallopian tubes had been found not to be patent. One authority reports that 10 per cent. of his patients, in such circumstances, became pregnant. It must be supposed that in such cases obstruction, whatever its nature, was easily overcome by the pressure of the carbon-dioxide gas.

A less elaborate and, perhaps, just as successful a method is that of injecting air by means of an india-rubber ball, in association with a manometer.

*Injection of Lipiodol.*—The injection of lipiodol is made to determine which part of the canal of the Fallopian tube is obstructed, if any. The lipiodol is injected into the uterus and directly afterwards the patient is X-rayed, and the outline of the uterine cavity and lumen of the Fallopian tubes, filled with lipiodol, can be clearly seen on the screen and a radiogram can be taken. If the tubes are patent then some of the lipiodol will be found to have trickled into the peritoneal cavity. If there is an obstruction in the Fallopian tube, or tubes, then the lipiodol will be held up at the point

of obstruction which can be clearly detected. It is curious that just as inflation was first tried for diagnostic purposes, and later was found to have a certain value in cases in which the Fallopian tubes were not patent, so it is with the injection of lipiodol. Forsdike claims a 34 per cent. of cures in sterile women with patent Fallopian tubes, after injecting the latter with lipiodol.

#### PREPARATION OF THE PATIENT.—

The inflation of the Fallopian tubes with carbon dioxide, or their injection with lipiodol, is better performed without an anæsthetic, if the patient does not mind the necessary exposure and manipulation. In the absence of anæsthesia if there is an obstruction the patient will complain of pain, and this being so the pressure of the gas, or the flow of lipiodol, can be more safely regulated than if the patient is unconscious, in which case, unless great care is taken, an obstructed tube might be ruptured.

Inflation, or injection, must never be attempted if there is any pelvic inflammation, or septic condition of the genital passages, or if the patient has serious disease of the heart or lungs.

The best time to carry out the test is about midway between the periods. The patient should have inserted into the vagina (or insert them herself) glycerine plugs for two days before the appointed time, which softens the cervix and makes it yield more easily, since the cervix has to be dilated to insert the inflation tube or injection syringe. The night before the operation the patient should be given an aperient.

## CHAPTER XIII.

### VAGINAL DISCHARGES.

UNDER this heading is included any discharge escaping from the vagina, other than the normal menstrual discharge, or an excess of blood. Such a discharge may be coming from the body or neck of the uterus, from the Fallopian tubes, vagina, bladder, rectum or peritoneal cavity. The mucous membrane of the Fallopian tubes and uterus, the lining of the vagina and skin and glands of the vulva, in their normal states, secrete a certain amount of discharge, while that from the uterus, vagina and vulva may, in such circumstances as just before menstruation, during pregnancy or sexual stimulation, be excessive, without being pathological. It will be useful, therefore, first of all shortly to describe the normal discharges.

*Fallopian Tube.*—The mucous membrane of the Fallopian tube secretes a small quantity of watery fluid.

*Body of the Uterus.*—The glands of the corporeal mucous membrane secrete a small quantity of watery fluid.

*Neck of the Uterus.*—The glands of the cervical mucous membrane secrete a clear, transparent, viscid fluid, the amount of which varies in different individuals. Its characteristic appearance can be seen only with the aid of a speculum as the discharge escapes through the external os. At the vulval orifice the secretion has lost its transparency, and is yellowish and flaky from being mixed with the vaginal discharge.

*Vagina.*—Glands in the vagina being absent the fluid portion of its secretion must be due to an oozing from its surface. Its white, at times yellowish-white, colour is due to its mixture with the epithelial cells which have been shed from the vagina, after they have undergone fatty degeneration, to which its flaky appearance is due also.



*Vulva*.—The following secretions have their origin in the vulva. Watery from the sweat glands, oily from the sebaceous glands, glairy and transparent from Bartholin's glands and serous from Tyson's glands. Through the agency of one or more of these secretions the inner surfaces of the labia majora, and the structures which they cover, are kept moist. In women who are not as cleanly in their habits as they should be, the fatty degenerated epithelial cells are apt to collect as a yellowish granular material, especially in the neighbourhood of the clitoris and labia minora.

Any discharge from the genital passages, therefore, which has one or the other of these characteristics, and is not excessive, except in those temporary circumstances mentioned above, when the glands are in a hyperactive condition, must be looked upon as normal. The difficulty is to determine what quantity may be regarded as excessive. A good guide is whether the discharge is sufficient to soil the underwear unduly, or to necessitate the use of a diaper.

Abnormal discharges from the genital passages can be well classified according to their appearance.

*Mucous*.—To such a discharge is properly given the name of leucorrhœa or "the whites"; these terms are often incorrectly applied to all discharges which are not bloody, watery or fæcal in character.

An abnormal mucous discharge, otherwise than of a temporary nature, is a proof that the glands of the cervix are secreting an excessive quantity. Such a condition may be due to the fact that there are more glands to secrete, the best example of which is associated with subinvolution of the uterus, a condition in which this organ has not returned to its proper size, or condition, after labour. Most commonly, however, such an abnormal discharge is due to the fact that the cervical mucous membrane is inflamed. Such inflammation is more likely to occur as the result of infection during labour, or the puerperium, or in women who are not virgins; nevertheless, there are always septic organisms in the neighbourhood of the vulva and lower third of the vagina, and if, for any reason, the resistance of a virgin is lowered, these organisms may travel up the genital canal and infect the cervical mucous membrane. Chronic endocervicitis (inflam-

mation of the cervical mucous membrane) often results in the formation of an "erosion" in that part of the cervix which projects into the vagina.

*Muco-purulent.*—This is due to the inflammation of the cervical mucous membrane causing the formation of pus.

*Pus.*—Pus escaping from the vaginal orifice may have its origin in the Fallopian tube, ovary, uterus, vagina, pelvic peritoneum or cellular tissue. The commonest causes of a purulent discharge are acute vaginitis, or the irritation of a foreign body in the vagina, generally a neglected pessary. A purulent discharge from the uterus is due either to an acute infection generally following labour, miscarriage or gonorrhœa, or to the sloughing of a tumour in the uterus. A purulent discharge may also be due to the chronic infections known as senile vaginitis and senile endometritis.

Pus, arising in some other situation in the pelvis may, as a result of ulceration, be discharged through the vagina, or more often through the rectum. Such conditions, therefore, as a pyosalpinx, ovarian abscess, a pelvic abscess due usually to infection *via* the Fallopian tube or perhaps to appendicitis, and an abscess in the pelvic cellular tissue, due to infection, the result of lacerations during childbirth or to operations or other injury, may be the origin of a purulent discharge from the genital passages.

*Water.*—A watery discharge escaping from the genital passages may come from the body of the uterus, bladder or ureter. Thus if there is more endometrium than normal, owing to the increased size of the uterus from subinvolution, or the presence of a tumour, the woman may complain of an excessive watery discharge. Inflammation of the endometrium, from any cause, when it becomes chronic may also give rise to the same complaint. If there is a hole between the bladder and vagina, as the result of ulceration, or injury, urine will escape into the vagina. Lastly, and unfortunately, it sometimes happens that during the operation of hysterectomy a ureter is severed, and the injury escapes notice, or the ureter is denuded of its blood supply and sloughs later. In such cases the cut, or sloughed end, of that part of the ureter which is attached to the kidneys may discharge urine into the pelvic cavity and this in time escapes through the abdominal

wound. Just as often, however, the cut end becomes engrafted into the top of the vagina, in which case the urine is discharged through that canal.

*Watery Blood.*—A watery discharge which is coloured with blood is most frequently due to carcinoma of the Fallopian tube, uterus or vagina. As cancer of the uterus is by far the commonest of the three, the discharge is generally due to such a cause. Rarely a watery blood discharge is due to mucous polypi of the uterus, and a complication of pregnancy, known as hydatid or vesicular mole, also gives rise to such a discharge.

*Fæcal.*—If there is a hole between the rectum and vagina fæces will escape *via* the latter canal. Such holes, may, as in the case of vesico-vaginal fistulæ, be due to injury during, or ulceration following, childbirth, or to ulceration due to syphilis, tubercle or cancer, or to the pressure of a neglected pessary.

*Offensive.*—It is obvious that, in many instances, the discharges mentioned above may be offensive. As, however, the first thing about a discharge that may strike a nurse is its offensive odour, the description dealing with this attribute has been placed under a separate paragraph. A very good example of an offensive odour being the first thing to warn a nurse that “something is seriously wrong” is that of an incomplete miscarriage. Some women pay but scant attention to miscarriages, and may not trouble to get any advice until they become seriously ill from septic infection. In such circumstances the nurse may notice the smell when going upstairs before she enters the bedroom. The discharge due to an ulcerating carcinoma, sarcoma or fibroid is intensely offensive, and that due to the presence in the vagina of a foreign body, senile endometritis or senile vaginitis may be nearly as bad. Discharges contaminated with fæces or urine are easily recognized from their odour. Except in the cases of fæcal and urinous discharges, the smell is due to the action of saprophytic organisms in the dead tissue, or in the secretions retained by the foreign body. A good example of such an action occurs in cases of incomplete miscarriage.

The importance of a vaginal discharge depends on its character and on the age and civil state (married or single) of the patient.



**From Infancy to Puberty.**—Before puberty the vagina, uterus and Fallopian tubes, being undeveloped, are very rarely the seat of disease. In most instances, therefore, under this heading the discharge flows from the vulva, and may be associated with anæmia, debility, threadworms, dirt, or due to injury or gonorrhœa. Rarely the vagina may be at fault, in which case the discharge is due to inflammation caused by gonorrhœa, or some acute fever. Foreign bodies which have been inserted into the vagina by the child, such as hairpins, pebbles, fruit-stones, may also be a cause.

In a large number of instances an apparent cause cannot be found for the discharge.

Gonorrhœa may be due to criminal assault, or it may be caused by infection from towels or bed-pans which have been soiled by some adult suffering from this disease. There are on record several outbreaks of this disease which has been spread by towels or bed-pans used in institutions for girls.

It is also well to remember that mothers are wont, at times, falsely to accuse men of assaulting their daughters, because the latter are suffering from leucorrhœa.

**From Puberty to Marriage.**—From puberty onwards a number of females suffer from leucorrhœa a day or two before, or a day or two after, menstruation. This is due to congestion of the uterus, and is so common that it may almost be accounted as normal.

Other causes may be anæmia; constipation; diabetes; tumours of the genital organs; misplacement of the uterus; erosion of the neck of the uterus; endometritis; foreign bodies in the vagina; or a chill giving rise to congestion.

By far the commonest causes in young women are sub-involution of the uterus and vagina; misplacements of the uterus and vagina; and septic infection, or puerperal fever, as it is termed. It may also be due to gonorrhœa.

As a rule six to eight weeks are required for complete involution of the uterus and vagina to take place, and when this does not occur, the increased area of mucous membrane accounts for the leucorrhœa.

In misplacement the discharge is due to congestion and the increased size of the organ, or to ulceration should the vagina and neck of the uterus protrude outside the vulva.

In puerperal fever microbes gain access to the genital tract, and set up inflammatory changes, which may become chronic.

In gonorrhœa the discharge, which is profuse and yellow or green, is composed of pus, and is due to the acute inflammation.

It must be remembered that cancer, fibroids and erosions of the cervix are much commoner in married women.

**After the Menopause.**—In addition to many of the conditions mentioned above, leucorrhœa at this age may be due to inflammatory conditions of the uterus and vagina known as senile endometritis and senile vaginitis.

It is, however, most important to remember that the menopause is the commonest time for malignant disease of the genital organs to appear, and that, although a discharge of blood is generally the first symptom of such a disease, nevertheless, any woman who, at this time of life, is suffering from a leucorrhœal discharge should consult a doctor, since very rarely such a discharge is the first intimation of the presence of cancer.

#### SYMPTOMS AND SIGNS.—

From the nurse's point of view there is but little to be said concerning the diagnosis of the source of the discharge. There is a symptom, however, known as *pruritus vulvæ*, which is directly due to the contamination of the vulva with the discharge, although it may occur independently of it; a short account of which, therefore, will be appended. Obviously a nurse can be of assistance to the doctor by telling him the nature of the discharge the patient has, if a specimen has not been saved, and there should be no difficulty in the nurse deciding whether a discharge is mucous, purulent, contaminated with blood or fæces and whether it is offensive. In the case of watery discharges, however, the doctor may want to know, particularly, whether this discharge is urine. A provisional diagnosis can be arrived at if the patient is recovering from a total hysterectomy, if she has just had a very difficult labour or if the nurse is attending a patient with cancer of the uterus or vagina, because, in such circumstances, the nurse will know that a urinous discharge may follow. In the case of childbirth such a discharge may appear at once, due to tearing of the vaginal wall and bladder from the use of

the forceps, or a few days later due to ulceration of these walls following serious and prolonged pressure of the foetal head. Apart from its smell, urine may be detected by soaking a piece of blue litmus paper in the discharge, which will then turn red.

#### TREATMENT.—

The treatment, which varies with the cause, comes under the province of the doctor. It may include some form of vaginal douching, and the nurse may be directed to carry this out (see p. 267).

#### NURSING.—

As the discharge is, in many cases, irritating to the vulva the nurse can usefully smear the parts with vaseline, or better still with a mixture of castor oil and zinc ointment in equal proportions. For offensive discharges, as with others, the nurse will carry out the treatment, perhaps douching, ordered by the doctor, and offensive discharges particularly will require a change of diapers and draw-sheets whenever they are soiled. Pessaries are not so frequently used as formerly, but a nurse, if she has the opportunity, must be careful to impress upon a woman wearing one the great importance of a daily douche to keep the instrument clean, and of having the instrument changed by a doctor every three months.

Many women suffering from a vaginal discharge due to chronic endocervicitis are obsessed with the idea that this is doing them a great deal of harm and that their "strength is being drained away." Such women are constantly seeking advice, or trying one or other remedy. If the cause of the discharge cannot be cured by local applications, or by some operation (and indeed in slight cases such procedures may be entirely unwarranted), and if the discharge is troublesome because of the soiling of the underlinen or the patient having to wear a diaper, an absorbent wool tampon, inserted into the vagina in the morning and removed at night, will be all that is necessary, and the patient may be assured that her health is not being affected.

### PRURITUS VULVÆ.

Pruritus vulvæ, which is characterized by severe itching of the vulva, is a very distressing complaint. It may be



present without any known cause, or it may be secondary to some local condition.

### **Primary Pruritus Vulvæ.—**

This is due to a neurosis.

### **Secondary Pruritus Vulvæ.—**

This is due to congestion or irritation.

*Congestion* of the vulva may be due to pregnancy, to the extra flow of blood to the parts during the few days preceding menstruation, or to the menopause. It also may be due to pressure on the veins of the pelvis by ovarian and fibroid tumours.

*Irritation.*—The vulval skin may be irritated by pediculi pubis and scabies; by the urine, as in the case of patients suffering from cystitis or diabetes, by leucorrhœa, or by eczema, herpes and leukoplakia.

#### **SYMPTOMS.—**

The itching may be paroxysmal in character, or more or less constant. It is generally worse at night or after exercise, when the patient is warm. It tends to become gradually more troublesome, and the scratching, which the sufferer finds necessary for her relief, only makes matters worse, by causing an eczematous condition of the vulva.

The irritation may become so intolerable that the patient will shun all society and even keep to one room, while there are cases on record in which the patient became insane and committed suicide, apparently from the great distress and loss of sleep occasioned by the constant irritation.

#### **SIGNS.—**

The urine of every woman complaining of pruritus vulvæ should always be examined for sugar in case this is the irritating agent. Diabetes is especially common in younger people, while the other causes mentioned are not nearly so common. In some cases, then, the nurse may easily arrive at a correct diagnosis. The comparatively rare disease known as leukoplakia of the vulva (see p. 213), when well marked, may be diagnosed by a nurse who knows her work. It is most important that it should be diagnosed at the earliest opportunity

as it is probably an antecedent condition to carcinoma of the vulva, and its proper treatment may anticipate the advent of this terrible condition.

TREATMENT.—

In most cases, if a cause can be found, the appropriate treatment will give very satisfactory results. In pruritus due to the menopause, old age or neurosis, however, in which no local cause can be discovered, the effect of treatment is often most disappointing. X-rays at times give relief, and in some cases excision of the whole or portion of the vulva has been found necessary.

NURSING.—

The local applications to prevent the vulva being contaminated, and within the reach of the nurse, have already been mentioned. Strict cleanliness will in many cases be very beneficial.

## PART IX.

### CHAPTER XIV.

#### DISTURBANCES OF MICTURITION.

THE following disturbances of micturition will be discussed : retention, incontinence, frequency, suppression, and pain. Although such disorders are found associated with other diseases, they may have a distinct bearing also on diseases of a gynæcological nature.

#### RETENTION OF URINE.

If a woman is unable to micturate, although the urine excreted by her kidneys is passing into her bladder, the latter organ becomes unduly distended, and the condition is termed retention of urine.

CAUSES.—

Retention of urine is due either to some interference with the nervous mechanism of micturition, or to pressure on the neck of the bladder and urethra.

**Interference with the Nervous Mechanism.**—*Hysteria*.—This may be the cause in young women who crave for sympathy, and whose nervous system is in an unstable condition.

*Unusual Position*.—The retention may be due to the patient being on her back, an unusual position for micturition.

*Pain in the Urethra or Bladder*.—If the act of micturition gives rise to severe pain the woman will decline to urinate as long as possible, and in this way retention sometimes results. The following are causes of pain in the urethra : inflammation of the urethra generally due to gonorrhœa ; urethral caruncle ; cancer implicating the urethra. Pelvic peritonitis causes pain by the contracting bladder moving the inflamed peritoneum.



Retention also occurs in some patients for a day or so after labour, due to pain caused by the necessary contraction of the abdominal muscles which may have been bruised, and so are tender, owing to pressure thereon by the midwife during the third stage of labour. Retention may also be due to the pain caused by the urine flowing over the vulva which has been torn, more particularly in the region of the urethra.

*Shock.*—Retention of urine is very common after operations, especially those on the abdomen, vagina, perineum, and rectum. The retention is due to the centre in the spinal cord, which controls the act of micturition, being temporarily affected by nerve impulses during the operation, or to injury to the nerve supply of the bladder.

*Disease of the Central Nervous System.*—In certain diseases of the nervous system the bladder is cut off from the higher centres which govern the act of voluntary micturition, the bladder then acting automatically. In locomotor ataxy there may be sudden and involuntary contractions of the bladder (vesical crises).

*Over-distension of the Bladder or Abdominal Walls.*—If a woman holds her water too long the bladder will become over-stretched, then, when she desires to micturate, the bladder muscle will not contract, and retention results. It is not an uncommon occurrence during the first day or so after labour for the patient to have retention of urine, because the abdominal muscles have been so stretched by the pregnant uterus that they cannot press on the bladder and so, as is their custom, assist this organ to contract.

**Pressure on the Neck of the Bladder or Urethra.**—The urethra being the muscular canal through which the urine leaves the bladder, it is evident that if the calibre of this tube is sufficiently narrowed, retention must result. The neck of the bladder may be compressed and urethra stretched by the cervix of a retroverted pregnant uterus. An ovarian cyst, or fluid in the pelvic cavity behind the uterus (blood, serum, or pus), may push the uterus against the neck of the bladder. If a fibroid tumour is nearly impacted in the pelvis, the addition to the tumour of an additional amount of blood may lead to impaction (tightly filling the cavity of the pelvis) and retention of urine. An additional amount of blood flows to the uterus

in the week preceding menstruation. The complication, therefore, of retention of urine just before the period, which may be relieved by the onset of the period, should indicate to the nurse that a fibroid tumour may be present, which diagnosis is all the more certain if the menstruation is excessive. Ignorance of these facts has often lead to the condition remaining undiagnosed for some months, especially in those cases in which the loss is not excessive (cervical fibroids). The lumen of the urethra may also be occluded by cancer, by a stone or by pressure of a fibroid polypus.

In the second stage of labour, the head may fill the vagina so tightly that the urethra is pressed upon, and if the bladder has not been emptied repeatedly during the first stage of labour, as it should be, retention may result.

If the vagina is efficiently plugged the urethra must be pressed upon and retention results. The knowledge of this will remind the nurse that before plugging the vagina, the bladder must be emptied, preferably by catheter, otherwise the plug may have to be taken out, before it should be, to allow the patient to empty the bladder.

#### SYMPTOMS AND SIGNS.—

The patient will complain of severe and continuous pain in the lower abdomen, with intermittent exacerbations, and will state that she cannot pass her water. An abdominal examination will disclose a central, soft and somewhat fluctuating swelling above the pubes, pressure upon which causes a certain amount of distress to the patient.

#### TREATMENT.—

It is most important that, the urine having been drawn off, the cause for the retention should be ascertained, since unless efficiently treated retention will give rise to cystitis.

For hysterical retention relief by catheter may be necessary on the first occasion, but every means should be taken to prevent a further continuance of its use. If a strong purge be given, micturition usually takes place when the bowels act. Another method is to seat the girl in a bath with hot water reaching to the hips, and then, without any warning, to empty a pailful of cold water over her head and body. Retention after labour, and following operations, is treated by an alteration in

the position of the patient, sponging the vulva with warm antiseptic lotion, placing the patient on a bed-pan containing a little hot water and by supra-pubic pressure. Some cases are successfully treated with an injection of pituitary extract, or by giving the patient to drink a drachm of the liquid extract of ergot in half a pint of soda water. If such harmless measures fail the catheter will have to be used.

For the remaining causes of retention appropriate treatment will be prescribed by the medical practitioner.

#### NURSING.—

If the nurse has to pass a catheter she must be most careful to carry out all the precautions mentioned on page 271.

### INCONTINENCE OF URINE.

Incontinence of urine is a term denoting the dribbling away of urine from the bladder irrespective of any wish of the patient. The urine may also dribble away from the end of a cut ureter which has been injured during a hysterectomy either by being tied or cut, or by its blood-supply being interfered with. In the latter case the ureter sloughs and the incontinence appears some ten days later, the cut or sloughing end being, as a rule, engrafted on to the top of the vagina. The ureter may also be injured in labour during the extraction of a child with the forceps. The following varieties of incontinence may be met with: false incontinence; true incontinence; incontinence of retention; and nocturnal incontinence.

#### False Incontinence.—

False incontinence is a condition in which the urine escapes from the bladder on the slightest exertion. The patient states that if she coughs, sneezes, laughs or strains as when lifting heavy weights, or when dancing, playing golf or tennis she is apt to "wet herself." Such a condition most commonly follows childbirth and is due to stretching of the sphincter of the bladder.

#### TREATMENT.—

The best treatment, and it is usually most successful, is for the sphincter to be tightened by an operation. An



alternative treatment, though not nearly so successful, is the use of electricity.

### **True Incontinence.—**

#### **CAUSES.—**

In this condition the urine cannot collect in the bladder because there is a hole leading from it into the vagina (a complication known as a vesico-vaginal fistula) or because the sphincter of the urethra has been badly damaged.

The fistula may be due to ulceration extending from the vagina into the bladder, from prolonged pressure of the head of the child during labour when its passage is obstructed in the pelvic cavity by a generally contracted pelvis, or to laceration of the vagina and bladder when the obstetric forceps are being used.

Cancer, tubercle, syphilis, or a neglected pessary, may also ulcerate from the vagina into the bladder. Lastly, the bladder may be injured during some operation on the vagina.

Injury to the sphincter of the urethra is due to childbirth, or to mechanical dilatation for purposes of a digital examination of the bladder.

#### **SYMPTOMS AND SIGNS.—**

The constant escape of urine causes much irritation and soreness of the vulva and adjacent parts while, unless the dressings are frequently changed, the stale urine remaining thereon becomes very offensive.

#### **TREATMENT.—**

If the fistula is due to injury it can be cured by a plastic operation. If due to disease and this can be cured, the fistula will heal.

### **Incontinence of Retention.—**

#### **CAUSE.—**

In some cases the pressure of the urine which is retained in the bladder becomes so great that the sphincter at the neck of the bladder is forced open. A small quantity of urine then escapes, and after the immediate pressure is relieved the sphincter again closes. The retention is, therefore, intermittent and the condition is known as "incontinence of

retention.” This incontinence of retention may occur more or less acutely in a case of incarcerated retroverted gravid uterus, but usually it is the result of some chronic condition.

#### SYMPTOMS AND SIGNS.—

The patient will complain of the symptoms enumerated under retention of urine and will be constantly passing a small quantity. The bladder will be found distended and, unless there is cystitis, the urine will be normal, in this respect differing from that associated with the frequent passage of small quantities due to cystitis, when the urine will be offensive, alkaline and contain pus.

#### TREATMENT.—

The bladder having been emptied with the catheter, the fact must at once be reported to a doctor.

This condition is really more dangerous than complete retention, since the nurse, if she is careless and does not notice that only a small quantity of urine is being passed at a time, is apt to regard the condition as one of frequency only and fails to report the matter as soon as she should do. It may then happen that, before the retention of urine is discovered, cystitis will have been set up, ending perhaps fatally.

#### Nocturnal Incontinence.—

In this condition, which generally occurs in young children, the urine is passed unconsciously while the child is asleep.

#### CAUSE.—

In some patients a cause cannot be discovered ; in others it is due to the presence of worms, stone in the bladder, polypus of the rectum, infection with the colon bacillus especially in young children, inflammation of the vulva, very acid urine or epilepsy.

#### TREATMENT.—

The treatment of nocturnal incontinence must depend upon the cause.

In the absence of any cause being discovered, the patient should sleep on a hard bed with very light clothing. If young she should be roused when her parents go to bed and made to empty her bladder. Very little drink should be

allowed with the last meal of the day. A large reel of cotton may be tied round the waist so that it rests on the spine; this will prevent the patient lying on her back, a position which seems to favour the involuntary expulsion of urine in these cases. Cold baths and a cold douche to the spine are often helpful.

For the medicinal treatment a doctor must be consulted; belladonna is the most successful drug to be employed.

## FREQUENCY OF MICTURITION.

### CAUSES.—

*Excessive Quantity of Urine.*—Hysteria, diabetes, chronic Bright's disease, a very acid urine or one loaded with oxalates and phosphates.

*Pressure on the Bladder.*—Pregnant uterus, ovarian tumour, fibroid tumour.

*Misplacement of the Bladder.*—Cystocele, with or without prolapse of the uterus. An indication that a cystocele may be the cause is the presence of a "lump" at the vaginal orifice and the fact that the urine escapes from the bladder on the slightest exertion, such as laughing or sneezing. When the patient is at rest there is no frequency.

*Disease of the Bladder.*—Acute and chronic cystitis, infection with bacillus coli.

*Pressure on the Urethra or Neck of the Bladder.*—Leading to incontinence or retention.

### TREATMENT.—

The passage of an excessive quantity of urine is, in most patients, a serious symptom, and a doctor should be consulted at once. The nurse must be careful to remember that frequency of micturition is also a sign of retention.

## PAINFUL MICTURITION.

### CAUSES.—

Cystitis, due to infection or associated with ulceration of the bladder; due to cancer or tubercle, to a stone or some other foreign body. It may also be due to pelvic inflammation, and



to inflammation of, or a growth in, the urethra and to the action of certain drugs, hexamine being a case in point.

TREATMENT.—

The treatment of these conditions is carried out by the doctor.

## SUPPRESSION OF URINE.

Suppression of urine, which may be partial or complete, is a condition in which the kidney is not acting properly. In complete suppression the patient will not micturate and the bladder is found to be empty. In partial suppression much less than the normal quantity of urine is passed.

CAUSES.—

Suppression of urine may be due to disease of the kidneys, or to occlusion of the ureters by cancer, or by a ligature accidentally applied during some operation in its neighbourhood. Suppression may follow the ligature of one ureter.

Partial suppression for the first twenty-four hours, after a severe operation involving a good deal of shock, is not an uncommon occurrence. It must be remembered, however, that the quantity of fluid drunk by the patient for some hours prior to and following an operation is much less than normal. Partial or total suppression of urine is associated with that complication of pregnancy known as eclampsia.

SYMPTOMS AND SIGNS.—

The patient does not suffer for the first few days. Vomiting then supervenes and becomes constant. She then becomes drowsy, may have convulsions, and passes into a coma.

SIGNS.—

The quantity of urine that is passed is much diminished, or the bladder is found empty on catheterization.

TREATMENT.—

If the suppression is not due to occluded ureters the doctor will order one or other of the following methods of treatment: hot-air baths, purges, dry-cupping to the loins, an intra-venous saline transfusion, continuous rectal saline and pilocarpin.

## PART X.

### CHAPTER XV.

#### DISPLACEMENTS OF THE UTERUS AND THE USE OF PESSARIES.

THE vagina, uterus, Fallopian tubes and ovaries may be displaced downwards. They are then said to be *prolapsed*. The uterus may also be displaced in other directions, thus it may be turned back, bent back, or turned forwards (Fig. 16). These various displacements may be combined. Prolapse of the anterior vaginal wall is generally associated with prolapse of part of the bladder and the resulting swelling, which appears at the vulval orifice, is known as a *cystocele*. Similarly, part of the rectum may be associated with prolapse of the posterior vaginal wall, the swelling being called a *rectocele*.

The nurse should again read over the sections and pages describing the structures that keep the pelvic organs in their natural position; she will then easily realize why, in certain circumstances, they should become displaced.

#### The Uterus.—

##### Backward Displacement.—

If the uterus is displaced so that its neck looks forward towards the bladder and its body backward towards the sacrum the condition is known as *retroversion*. If the body of the uterus is bent backwards and its neck is looking in its normal direction towards the sacrum, the condition is known as *retroflexion*. In most cases of backward displacement the retroversion and retroflexion are combined, so that while the body is bent back at the neck, nevertheless the neck is directed

somewhat forwards. These two varieties, therefore, will be described as a whole.

CAUSES.—

1. Congenital.
2. Pregnancy, Labour and Puerperium.
3. Tumours.
4. Pelvic peritonitis.

1. *Congenital*.—In a large number of women who have not given birth to a child, and in whom there is no evidence of

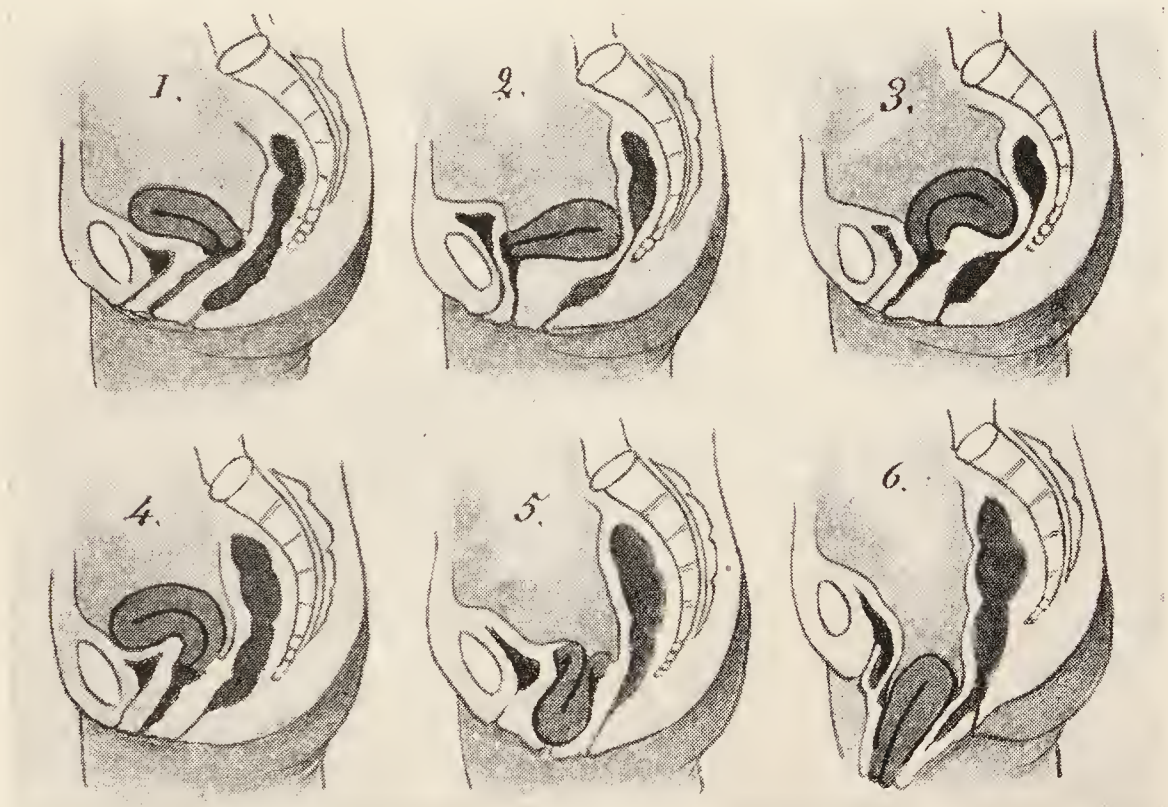


FIG. 16.—Position of the uterus. 1. Normal ; 2. Retroversion ; 3. Retroflexion ; 4. Antelexion ; 5. Inversion ; 6. Prolapse, also prolapse of the vaginal walls.

a tumour or of pelvic peritonitis, the uterus is found to be displaced backwards. It is fair, therefore, to assume that in such patients the displacement may be of congenital origin or, at any rate, to a misplacement during the development of the uterus between birth and puberty.

2. *Pregnancy, Labour and Puerperium*.—The commonest cause of backward displacement of the uterus is due to the fact that the woman has given birth to one or more children.



The reason why this should be so is not difficult to understand. Directly after a miscarriage, or a full-time labour, the uterus is much heavier than before, in the latter case two pounds instead of two ounces. It is often soft, its ligaments have increased in length, and the pelvic floor may have been unduly stretched or torn. If, then, after a miscarriage or labour, the woman lies on her back, the heavy, soft and very movable uterus falls back on to the sacrum. If the woman is encouraged to assume such a position as the proper one, or is not warned against so doing, the uterus, as it decreases in size, sinks below the sacral promontory, and the intra-abdominal pressure, acting through the small intestines, which are now lying against the anterior surface of the body of the uterus, prevents this organ from regaining its correct position. After the pregnant uterus has expelled its contents, certain processes take place in it, known as involution, the result of which is that this organ then returns to the position and condition which is normal to the unimpregnated woman. The circulation in the uterus which is displaced backwards is not so satisfactory as it should be, and so the organ becomes congested. The process of involution does not progress so well in a congested uterus, and the muscle thereof, instead of becoming firm, remains soft. When the woman gets up the uterus might be expected to tilt forwards, but as it is already being held back by the pressure of the small intestines, there is no encouragement for it to do so, and, as a fact, it very often remains where it is and is kept there indefinitely. Lastly, owing to the fact that the uterine muscle remains soft it can easily bend on itself at the junction of the cervix with the body, and so, in addition to the version, flexion results.

#### RETROVERSION.—

*Gravid Uterus.*—Such a condition is, in nearly every case, due to the fact that the uterus was retroverted before it became gravid.

If the uterus is already retroverted when the patient becomes pregnant, as the foetus grows one of four things will happen :—

1. The uterus as it increases in size will escape from underneath the sacral promontory and the pregnancy will

continue. This is perhaps the commonest termination.

2. The uterus will empty itself. This is probably one of the commonest causes of miscarriage.
3. The uterus, at the twelfth week, becomes incarcerated. Following this it may pouch and most of the fœtus will escape into the pouch which projects into the abdominal cavity. More frequently, the patient miscarries. If, however, the uterus does not pouch or empty itself retention of urine results, and if this is neglected, cystitis develops, the inflammation may spread along the ureters to the kidneys and may cause the death of the patient. On occasions the bladder has been known to burst, because of the weakening of its wall due to ulceration from the cystitis.
4. Rarely retroversion may follow a sharp blow or fall in a woman some twelve weeks pregnant, in whom a full bladder has pushed the uterus back to a horizontal position. In this case the increased intra-abdominal pressure, applied to the top or anterior surface of the uterus, forces it back below the promontory of the sacrum which imprisons it.

#### NON-GRAVID UTERUS.—

*Tumours.*—The weight of a fibroid tumour in the anterior, or posterior, wall of the uterus may cause it to fall backwards. Likewise an ovarian tumour pressing on its anterior surface will do the same. These are rare causes.

*Pelvic Peritonitis.*—As the result of this disease adhesions form. These adhesions in time contract, and if they are attached to the back of the uterus they may pull it back and fix it. It is a fact that the uterus is often found retroverted and fixed in cases of pelvic peritonitis and salpingitis. Whether the uterus was in a normal position before the advent of these diseases is a question. More probably it was displaced backward, and the adhesions having formed fixed it there.

#### SYMPTOMS.—

These depend on the cause of the displacement. Thus in congenital cases they are usually absent. Following miscarriage



or labour, the usual symptoms, if any, are menorrhagia, discharge and backache due to subinvolution of the uterus. The symptoms and signs associated with a retroverted gravid uterus are those of miscarriage or incarceration. The symp-

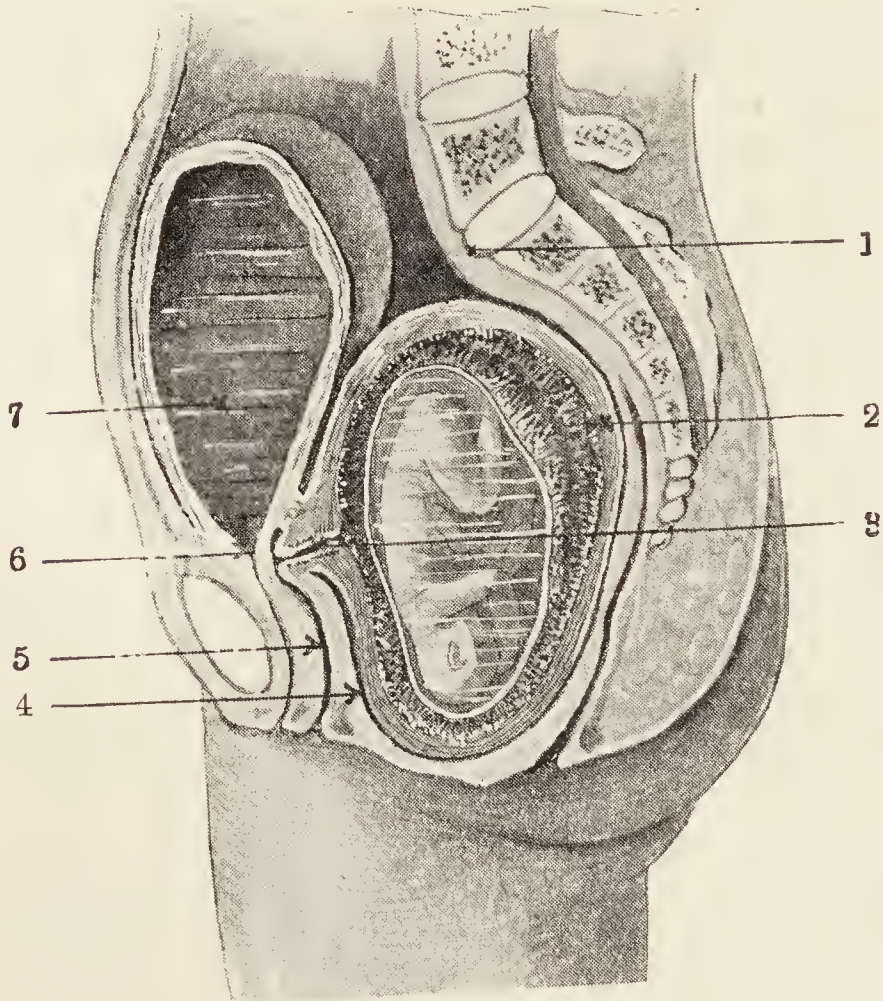


FIG. 17.—Incarceration of the retroverted gravid uterus. Body of woman divided in half showing the body of the uterus imprisoned below the promontory of the sacrum and the neck of the uterus directed forwards and upwards, so stretching the vagina, flattening the urethra and pressing against the neck of the bladder, thus causing retention of urine. 1. Promontory of sacrum ; 2. Body of uterus ; 3. Neck of uterus ; 4. Vagina ; 5. Urethra ; 6. Junction of urethra with bladder ; 7. Bladder.

toms of incarceration, as a rule, come on slowly and are striking since, together with those of a twelve weeks' pregnancy, there will be some serious trouble with micturition. Such a woman may first seek the advice of a doctor because



she has retention of urine or great frequency in passing water. The retention is due to the fact that the neck of the uterus, which is looking forward, as a result of the increased size of the body of the uterus, is driven farther forwards and upwards until it stretches the anterior vaginal wall so much that the urethra, which is attached to it, is very stretched and its canal is flattened. The pressure on the urethra at its junction with the bladder by the cervix may also assist in the obstruction (Fig. 17).

The obstruction may not be absolute, with the result that when the tension in the bladder, due to the retained urine, is raised to a certain point a small quantity of urine is forced through the urethral canal, the pressure in the bladder then falling, urine no longer escapes until the pressure in the bladder again becomes excessive. In this case the woman complains of frequency of micturition, the amount passed being small in quantity, a condition known as the *incontinence of retention*.

In the acute cases the patient will complain of some abdominal pain.

The symptoms of retroversion due to tumours and pelvic inflammation are those of their respective causes.

#### SIGNS.—

For the most part these will be recognized by the doctor. In a patient suffering from retention of urine due to incarceration of the uterus, however, the nurse may identify the early symptoms and signs of pregnancy and, in addition, the distended bladder forms a well-marked abdominal tumour, which is central, soft and fluctuating, and pressure thereon causes a desire, on the part of the patient, to micturate. In most cases of retention of urine due to incarceration of the uterus an average of 5 pints of urine will be drawn off by the catheter. as many as 10 pints have been evacuated.

#### TREATMENT.—

After labour, or miscarriage, patients should not lie on their backs for any length of time. Before the doctor finishes his attendance he should make a vaginal examination, and if he finds the uterus displaced backwards he should insert a pessary which will keep the uterus, more or less, in its normal position. After a few months, when the uterine muscle has

become firm, the pessary can be removed and the patient is cured.

Doctors, however, do not always have the opportunity here mentioned, and may only see the patient later. If the displacement is discovered accidentally, that is in the course of an examination for some complaint which has nothing to do with the retroversion, treatment is not required, as also in the case of congenital displacements. If, however, the displacement is giving rise to symptoms, the condition found on examination will be treated. If the displacement is not due to a tumour, or pelvic inflammation, and a pessary will give relief, the patient may be satisfied therewith. An alternative treatment is an operation for shortening the round ligaments, by which means the uterus will be pulled forwards and fixed in its normal position. In the case of a retroverted gravid uterus, the doctor will replace it and insert a pessary, which the patient will wear till the fifth month, that is until it is impossible for the uterus again to fall back and become incarcerated.

If the gravid uterus is incarcerated, the doctor will endeavour to replace the uterus and then insert a ring pessary. If this fails to correct the position of the uterus he will leave the pessary, *in situ*, because it has been found that its continuous pressure will, in nearly every case, in due course rectify the malposition. Meanwhile retention of urine must be prevented by regular catheterization under the strictest aseptic precautions.

If the pessary fails the doctor will decide whether to empty the uterus or rectify the malposition by an abdominal operation.

#### NURSING.—

The nurse should advise a woman who has had a child or a miscarriage, and who complains of menorrhagia, discharge and backache, to consult a doctor. The nurse may also have the opportunity of giving advice if the patient has had a pessary inserted. It is not difficult for a nurse to diagnose the distension of the bladder in a case of incarceration of the retroverted gravid uterus, and the passage of a catheter will not only relieve the patient, but will also confirm the suspicion of the nurse as to the nature of the complication.

## Prolapse of the Uterus.—

### CAUSES.—

1. Injury to the pelvic floor.
2. Increased intra-abdominal pressure.
3. Ill-health.
4. Congenital.

1. *Injury to the Pelvic Floor.*—By far the commonest cause of prolapse of the uterus is stretching, or laceration of the levatores ani muscles and of the transverse cervical ligaments during childbirth. If the uterus does not involute properly it is heavier, and this is an additional factor in the displacement, as is the fact that the other ligaments have been lengthened during pregnancy. The uterus cannot fall through the opening in the pelvic floor in which it is inserted without dragging with it the walls of the vagina and the bladder, the base of which is attached to the anterior vaginal wall. It is obvious that there must be various degrees of “falling of the womb” according to the distance it has sunk. If the condition remains untreated it is only a matter of time before the whole of the uterus is outside the vulval orifice dragging with it the walls of the vagina which are thus inverted. Such a complete prolapse is called *procidentia*. The uterus, however, cannot sink very far through the hole in the pelvic floor unless it first becomes retroverted, the axis of the vaginal canal being downwards and forwards.

2. *Increased Abdominal Pressure.*—The weight of some tumour, the repeated and violent effects of coughing in chronic bronchitis, strenuous work of a bearing-down character, or the accumulation of fluid in the abdomen may force the uterus downwards by causing it to stretch the hole in the pelvic floor. These are rare causes.

3. *Ill-health.*—Another rare cause is chronic ill-health of the individual increased by under-feeding and hard work, in which case the uterine supports become loose and allow the uterus to sink.

4. *Congenital.*—Found in young women who have never been pregnant, and whose health otherwise appears satisfactory. Very rare.



## SYMPTOMS AND SIGNS.—

These depend a good deal on the cause. It is only necessary here to discuss those of the commonest variety due to injury of the pelvic floor. Such women will complain of backache, some trouble with micturition, the feeling of a lump at the vaginal orifice, which may be a cause of discomfort on walking or sitting down. If there is subinvolution in addition there may be menorrhagia and a discharge. In cases of procidentia the inverted vaginal walls and the cervix may be injured by friction against the clothes, the ulceration therefrom causing a blood-stained discharge. Micturition may be frequent, due to irritation of the mucous membrane of the bladder by urine which cannot escape because of a cystocele. If the cystocele is very marked the woman may be unable to empty her bladder without “pressing up the lump.”

It is very doubtful whether a retroverted uterus *per se*, that is one not markedly enlarged by a tumour or subinvolution, can cause frequency of micturition by pressure of its neck against the bladder.

The signs depend on the severity of the prolapse. At first a swelling will be noticed protruding through the vaginal orifice, especially when the patient strains. This swelling is either the anterior or posterior vaginal wall or both, dragging with them part of the bladder and rectal walls. When the condition is more advanced the neck of the uterus can be identified outside the vulva and on it, and on the vaginal walls, there may be ulcers.

## TREATMENT.—

In many patients some form of pessary will suffice to keep the uterus and vaginal walls in position. Many women refuse to put up with the trouble associated with the wearing of a pessary, or it fails in its object, and a plastic operation (in such cases anterior and posterior colporrhaphy and suspension of the uterus) is necessary, and in all except old women, or in women who are suffering from some disease, or condition, making an operation inadvisable, this is the best treatment.

**Anteversion.**—

## CAUSES.—

1. Lax abdominal walls.
2. Contracted pelvis.

1. *Lax Abdominal Walls*.—In some women who have lax abdominal walls, and especially, therefore, in the case of a woman who has had children, the gravid uterus falls forwards to an abnormal extent.

2. *Contracted Pelvis*.—Anteversion is encouraged if the pelvis is contracted at its brim and the head of the child cannot enter therein.

#### SYMPTOMS AND SIGNS.—

Abnormal anteversion of the pregnant uterus may give rise to a good deal of discomfort, and moreover, apart from any contraction of the pelvis may, when labour ensues, lead to delay, as the head will meet with difficulty in entering the brim and so perhaps become displaced.

#### TREATMENT.—

A doctor will examine the patient with a view to ascertaining whether there is a contraction of the pelvis and, apart from the appropriate treatment required in such a case, will order an abdominal belt to be worn to prevent the uterus falling forwards.

#### Inversion.—

1. Childbirth. Acute inversion.
2. Tumours. Chronic inversion.

1. *Childbirth*.—If, in the third stage of labour and in the interval of a pain, the top of the uterus is pulled upon, or pushed upon, it is likely to dimple. This small portion starts the inversion, being treated as a foreign body by the rest of the organ. The inversion thus begun continues till the uterus, which is turned inside out, is expelled into the vaginal canal and perhaps through the vulval orifice.

The top of the uterus can be pulled upon if the placenta is still attached to it, by the weight of the child if the woman is in an upright position at its birth (precipitate labour), if the umbilical cord is so short (either actual, or relative, being wound round the neck) that the progress of the child is hindered, or if a careless and ignorant midwife, or nurse, pulls upon the umbilical cord to deliver the placenta.

The top of the uterus is pushed upon, if the woman sits up to defæcate or micturate just after labour, or when the

attendant squeezes it and forces it downwards in an endeavour to express the placenta. Probably no harm will result in any of these circumstances if the uterus is contracting.

2. *Tumour*.—Rarely a fibroid tumour, or cancer, situated at the top of the uterus will cause the latter to dimple and give rise to a certain amount of inversion.

#### SYMPTOMS AND SIGNS.—

In most cases of acute inversion the woman is seized with great pain and there may be severe post-partum hæmorrhage. If the whole of the uterus is turned inside out, a red bleeding lump will be seen protruding through the vulval orifice with the placenta attached to it or not, as the case may be, and the uterus cannot be felt on abdominal examination. If the inversion is incomplete a swelling will be found on vaginal examination, and if the patient is easy to examine, a dimpling will be felt at the top of the uterus *per abdomen*. Rarely when the inversion is incomplete it does not give rise to any alarming symptoms, and escaping notice becomes chronic.

The symptoms of chronic inversion of the uterus are those of bleeding, discharge, and pelvic pain, which a woman may tolerate for a year or more before seeking advice.

#### TREATMENT.—

As two-thirds of the patients suffering from acute inversion die within a short time unless treated, a doctor if not in attendance must at once be summoned, and meanwhile the nurse must do her best, if the patient is bleeding severely, to reinvert the uterus. This she does by taking hold of the inverted body of the uterus, squeezing the blood out of it, and then gently pushing it back, the highest part, namely that which came down last, being put back first, and so on. If the placenta is attached it should not be interfered with, unless it is nearly separated when it should first be removed. After the uterus has been replaced the patient should be given a hot antiseptic douche to wash away any microbes, and femergin, to encourage the uterus to retract, and in addition stimulants to combat the severe shock. If bleeding is absent and the patient is suffering from shock only, the nurse should not interfere and should await the arrival of the doctor.

In the chronic variety, due to childbirth, the doctor will



probably be able to reinvert the uterus with the aid of an Aveling's reposer. This is a painful process, and the patient will have to be kept under the influence of morphia. Failing this some operative procedure will be necessary. When the inversion is due to a tumour the treatment will be directed towards its removal and not to the inversion.

Inversion of the uterus is extremely rare, and but few doctors, or nurses, ever see the complication.

The subject is mentioned here only because a doctor, or midwife, may not have been in attendance on the patient, and being an extreme emergency a nurse may be the first person summoned.

### USE OF PESSARIES.

The modern treatment of displacement of the uterus and vagina inclines less and less to the use of pessaries. Young women, knowing that they can be cured by operation, wisely select this method of treatment, rather than put up with the inconvenience and expense associated with the use of such instruments and refuse to retain their disability to the end of their lives. In a certain number of patients, pessaries fail to correct the misplacement, or cannot be retained in the vagina. In others a pessary cannot be tolerated because its presence causes a septic discharge and at times ulceration. The results of the modern operations for displacement of the uterus and vagina are so successful that the gynæcologist has no hesitation in recommending them. Some authorities contend that all pessaries should be burnt or put in museums. Such statements, however, are absurd, since there is no doubt, that in selected cases, pessaries not only relieve the patient but their use is particularly indicated when the age, or state of health, of the patient contra-indicates an operation.

Pessaries are used to prop up the uterus and vaginal walls and ovaries when they are prolapsed, and to keep a backwardly displaced uterus in the normal position.

*Prolapse of the Uterus and Vaginal Walls.*—The pessaries used for these conditions are known as the ring pessary and Napier's cup and stem pessary. The ring pessary consists of several watch springs bound together and covered with india-rubber. Ring pessaries vary in size and the doctor decides

which to use by experience. There should be just room for the tip of the index finger between the front of the pessary and the back of the symphysis pubis.

In many cases such an instrument is sufficient to give relief and the patient is satisfied. If, however, the perineal body is deficient a ring pessary may slip out on defæcation or micturition. The ring pessary is also used with much success in cases of retroverted gravid uterus when the doctor cannot replace this organ manually. In these circumstances, if such an instrument is left in the vagina for two or three days, the pregnant uterus will be found to have righted itself. When the perineum is deficient, and in elderly women, or in women in a bad state of health, in whom an operation is contra-indicated, if a ring pessary will not stay in position, a Napier's india-rubber cup and stem pessary acts very well. The disadvantage of this instrument is that it necessitates the use of a waistband, between which and the stem of the pessary are attached four pieces of india-rubber and tape, these by their tension keeping the pessary in position. Moreover, a Napier's pessary has to be removed every night and reinserted every morning, which is a good thing so far as cleanliness goes, but is a constant source of trouble to the patient.

*Prolapse of the Vaginal Walls—Cystocele, Rectocele.*—This misplacement can easily be cured by operation. If a patient does not wish to be cured of such a condition, a ring pessary will generally afford relief.

*Prolapsed Ovaries.*—The ovaries may be prolapsed, with or without displacement of the uterus, and will then rest in the pouch of Douglas, at times being nipped between the back of the uterus and the posterior vaginal wall. In some women such a position does not cause any trouble, others complain bitterly of a dragging pain, of dyspareunia, or of pain in the left side when the bowels act, due to the scybala pressing against the ovary on their passage through the rectum. Such misplacements can easily be remedied by an operation, but, apart from this, the insertion of a ring pessary will result in the ovaries being better supported, and many patients are satisfied with the relief thus obtained.

*Backward Displacement of the Uterus.*—If such a displacement is not causing any symptoms, and is discovered during

a routine examination of the patient, it does not require any treatment, operative or instrumental. In some cases, however, a backwardly displaced uterus certainly causes menorrhagia, backache, dysmenorrhœa, dyspareunia, one or more of these, and is at times the cause of sterility. Backward displacement can be cured by operation. If, however, the patient does not wish for such treatment, a pessary may, and often does, relieve her. There are two varieties of pessaries used for backward displacement, a ring and a Hodge pessary, the choice depending upon the particular variety of displacement and the relief obtained.

If the uterus is retroverted only, a Hodge pessary will tilt the body forward by pulling back the neck.

If the uterus is retroflexed only, it shows that the muscle at the junction of its body and neck is soft. In such a case, a Hodge pessary is contraindicated, since when it drags back the neck, the body does not tilt forwards and the condition is made worse. All that can be done, in such circumstances, apart from an operation, is to insert a ring pessary which, by holding up the uterus, relieves to some extent the congestion, and the symptoms being improved the patient is satisfied.

If, as is generally the case, the displacement is a combination of retroversion and retroflexion, it shows that softening is present. In some cases this softening is not sufficient to prevent the body being tilted forward by a pessary, in other cases it is. In the first place a Hodge pessary may give relief, in the second a ring pessary will have to be used. The suitable pattern can be ascertained only by trying each variety of pessary and ascertaining which gives the most relief.

## THE CARE OF PESSARIES.

Every woman who has had a ring or Hodge pessary inserted into her vagina should be warned that she must use an antiseptic douche daily, and go to a doctor every three months to have it taken out, cleansed and replaced or changed. If this is not done the secretions of the uterus and vagina will collect round the pessary and, becoming infected, will cause inflammation of the vagina resulting in a discharge, perhaps of an offensive nature. Moreover, if a pessary is left too long in the vagina it may cause ulceration of the vaginal walls,



which ulceration may extend into the bladder or rectum. The care of a Napier's pessary has already been described. If a pessary is fitting properly the woman should not be aware of its presence. If, therefore, a woman complains that



FIG. 18.—Method of holding the pessary before insertion. It is squeezed between the index finger and thumb.



FIG. 19.—Inserting the pessary through the vulval orifice.

her pessary is hurting her, the nurse should advise her at once to consult her doctor. Sometimes the pain or discomfort is due to pressure, which may lead to ulceration, or the back part of the pessary may be nipping an ovary.

If a woman is wearing a pessary and becomes pregnant, she

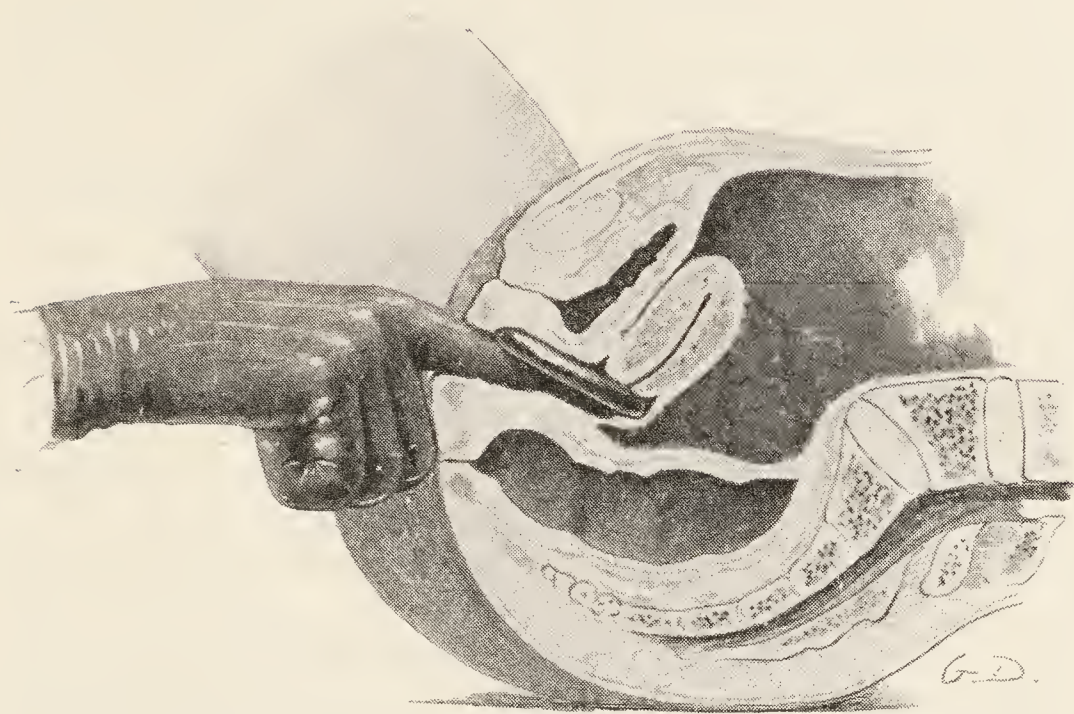


FIG. 20.—Carrying the distal part of the pessary back behind the cervix after the pessary has been inserted into the vagina.

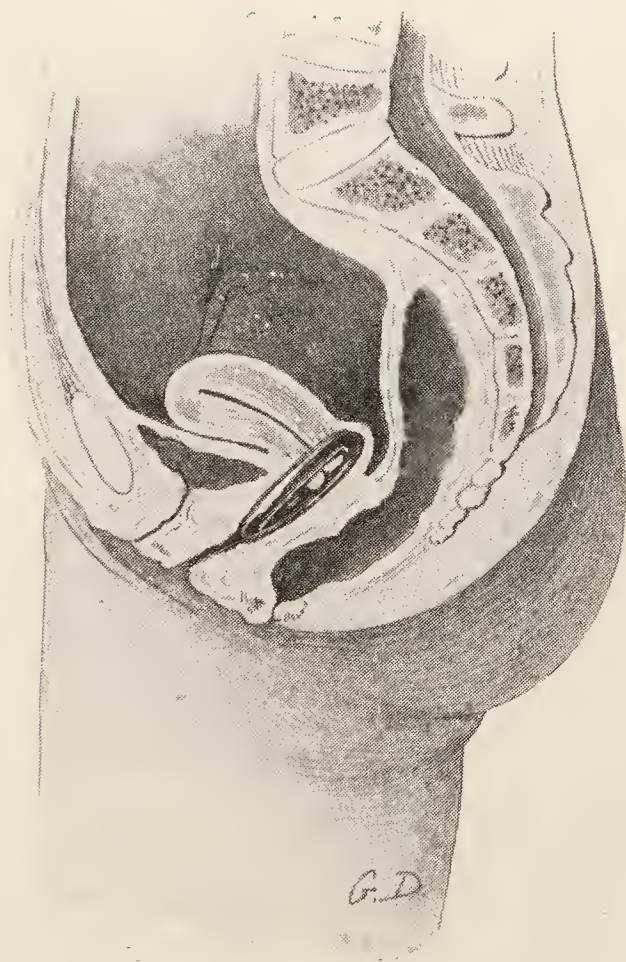


FIG. 21.—The pessary in the correct position, the woman standing up.



should have it removed by a doctor during the fifth month, by which time there will not be any danger of the uterus falling back and becoming incarcerated.

There are many shapes of pessary, but the three mentioned are those most frequently employed: they are sterilized by insertion in boiling water for a minute or two, or by immersion in an antiseptic.

**Insertion of a Pessary** (see Figs. 18-21).—It is the duty of the doctor to insert a pessary, and it can be on rare occasions only that a nurse is called upon to do so. There may, however, be occasions on which it is necessary for a patient to have her pessary changed and she is unable to secure the services of a medical man. Even then the services of the nurse must be limited to the extraction and insertion of a ring pessary, since for the proper insertion of a Hodge pessary the uterus has first to be replaced in its normal position, a procedure which a nurse cannot be expected to accomplish, and which, indeed, she should not essay.

The method of inserting a ring pessary can be taught practically much better in a few minutes than by any description, and nurses attending the gynæcological out-patient department, and who intend to practise as district nurses, would do well to ask the doctor to teach them the proper method. The patient should be lying in the left lateral position with the right leg well drawn up. The ring, having been inserted in boiling water for a few minutes to soften the rubber and sterilize the surface, is pinched by the thumb and index finger of the right hand till it is compressed into an ellipse. With the left hand separating the labia the pessary is introduced through the vulval orifice, one edge directed towards the apex of the pelvic arch and the other edge towards the perineum. When most of the pessary has disappeared into the vagina the ring is allowed to expand with the result that the whole of the pessary disappears. The forefinger is then passed into the vagina and the pessary is turned round so that its edges now rest against the sides of the vagina. Lastly, again with the forefinger, the upper part of the ring pessary is hooked behind the cervix, so that it is resting in the posterior vaginal fornix, the cervix now being surrounded by the ring. Many women learn to remove and replace ring pessaries themselves.



## PART XI.

### IMMUNITY AND INFECTION.

#### CHAPTER XVI.

#### IMMUNITY.

THE power of an individual to protect itself against the results of bacterial invasion is due to four factors :—

1. Certain secretions called antibodies, derived from the cells of the body. Such antibodies are always present in the blood-serum in minute quantities and become markedly increased in quantity when the individual is attacked by bacteria.
2. Certain cells called phagocytes, derived from the tissues of the body.
3. A substance called the complement, always present in blood-serum.
4. The healthy skin of the body which is resistant to the invasion of bacteria.

These four factors constitute the condition known as immunity.

If an individual incurs the risk of “ catching ” certain contagious, or infectious, diseases but escapes, he or she is said to be immune from that disease. Such an immunity, which is either natural or acquired, may be permanent or temporary.

*Natural* when the skin of the individual is intact and he or she has such a supply of healthy phagocytes, and such a quantity of antibodies and complement, that they are able to kill the bacteria and neutralize their poisons. It is probable that the condition known as natural immunity may, nevertheless, be due to recurring infections of very small doses of bacteria

and their poisons—so small that the individual does not contract the disease; that is, the immunity is really an acquired one, since bacteria, of certain varieties, at any rate, are always with us. Such acquired immunity may be short-lived, as in the case of a person who returns full of health from a holiday, and immediately catches a cold. Again, a surgeon after his yearly holiday may lose his life from pricking himself when operating on a septic case, whereas before the holiday he might have done so with impunity since he has had a year's small doses of streptococcal poison. The same applies to a post-mortem attendant or a nurse.

*Acquired* if by a previous attack of the diseases, or by artificial methods to be indicated later, the individual acquires a similar protection.

It must be remembered, however, that phagocytes cannot act efficiently unless aided by certain of the antibodies.

### Antibodies.—

The antibodies which can be found in the blood of an immunized animal may be divided into two groups :—

1. Those which neutralize exotoxins. Antitoxic bodies.
2. Those which neutralize endotoxins. Antibacterial bodies.

**ANTITOXIC BODIES.**—These consist of substances secreted by cells of the body and consist of antitoxins.

*Antitoxins.*—Antitoxins can be obtained in a test-tube by growing the bacteria in broth for some days and then filtering the broth. That this filtrate contains the exotoxins can be proved by injecting into an animal a quantity of the filtrate. The smallest quantity which will kill the animal is known as the minimum lethal dose. It has been found, however, that if a much smaller quantity than the minimum lethal dose is injected, and then with repeated injections this quantity is gradually increased, it is possible in time to inject far greater doses than the minimum lethal dose, without harming the animal, and the animal is then said to be immunized.

If some of the blood-serum from an animal thus treated is now taken and mixed with a lethal dose of the filtrate, the

mixture can be injected into another animal with impunity. Obviously, therefore, the blood of the immunized animal must contain an antidote to the exotoxins, and this antidote is called an antitoxin.

Unfortunately, it is not every variety of exotoxin which stimulates the body-cells to produce antitoxins. Only a few do this, the commonest examples being the bacilli of diphtheria and tetanus, in which diseases the bacilli do not, as a rule, invade the blood-stream, but are fixed in the throat or wound respectively, their exotoxins only being absorbed. If an individual contracts diphtheria, tetanus, bacillary dysentery or scarlet fever, for instance, and recovers, his body-cells have produced sufficient antitoxins to neutralize the exotoxins; if he dies the quantity is too small.

In the light of the experiment recorded, therefore, it should be possible, by injecting a sufficient quantity of antitoxin to afford protection against contracting the disease or, if the disease has been acquired, to cure it. Up to a point this can be done, as witness the antityphoid, antitetanus, antiplague, anticholera antitoxins.

**ANTIBACTERIAL BODIES.**—These consist of substances called agglutinins, lysins, precipitins, opsonins and complement fixers. The presence and action of antibacterial bodies has been ascertained by methods similar to those mentioned under antitoxins, an emulsion of dead bacteria being used.

*Agglutinins.*—These substances cause the bacteria to stick to each other, “clumping” as it is called technically. That this antibody is present in an immunized animal can be proved by adding its blood-serum to fluids containing bacteria similar to those with which the animal was immunized, and then placing a drop of the solution under the microscope, when the bacteria will be seen to clump. It is not known what part the agglutinins play in immunity, since such an animal may be immune although the bacteria will not clump; thus relapses may occur in typhoid fever when the agglutinating power of the blood-serum is at its highest.

The antibody is, however, of definite use in diagnosing typhoid and para-typhoid fever, amœbic dysentery, cholera, glanders and Malta fever. It may be taken as a working rule, the exceptions to which need not concern us, that if the



blood-serum of a patient, diluted to a certain strength, clumps the bacteria of the supposed disease, the patient has that disease. This test, so far as typhoid fever is concerned, is known as the "Widal reaction."

*Lysins*.—These substances dissolve bacteria or shrink them. In addition, the knowledge of the presence of a particular bacteriolysin is very important from a diagnostic point of view. Thus if the disease from which a patient is suffering cannot be diagnosed, but it is found that his, or her, blood-serum will shrink or dissolve a particular species of bacteria, it may be taken for granted that this microbe is the infecting agent. This antibody has the same name, but is different from the bacterial poison.

*Precipitins*.—These are substances found in the blood-serum of an animal immunized against bacteria, which produce a precipitate in a clear solution of the filtrate from a test-tube culture of the same species of bacteria. They are found also in the blood-serum of an animal immunized by the injection of animal or vegetable albumins. Precipitins cause a precipitate to be formed similar to the albumins found in the test-tube.

This test is but rarely used in disease, but it is of very great importance from a medico-legal point of view. Thus, after a rabbit has been treated with repeated injections of human blood, its blood-serum will precipitate the albumin in a solution of human blood in a test-tube, but it will not precipitate the albumin in a solution of the blood of any other animal. If, therefore, blood stains are found on the clothes of a suspected murderer, he may maintain that the blood was that of an ox or sheep, if for instance he is a butcher. Supposing now that a solution is made from the blood on his clothes and some blood-serum from an animal immunized against human serum is added and does not cause a precipitate to form, the accused person is telling the truth, and *vice versa*. By similar methods it is possible to determine whether a particular sausage is made of pig, horse, cat or dog.

*Opsonins*.—These substances are appetizers. They make the bacteria more palatable for the phagocytes.

*Complement fixer*.—This substance is necessary for the complement to act.

**Complement.**—This substance is present in the blood-serum. Certain of the antibodies cannot act except in its presence.

**Phagocytes.**—

The name phagocyte was given by Metchnikoff to certain white blood corpuscles found in the blood, and the process by which these phagocytes first ingest and then destroy the bacteria is known as phagocytosis. These phagocytes can be seen, under the microscope, ingesting and then digesting the bacteria. Normally there are in a drop of blood, the size of a pin's head, 7000 to 8000 phagocytes. In bacterial invasion the number may increase up to 40,000. The concentration of a large number of phagocytes at the site of a local lesion results in the formation of pus, and may prevent a local infection from becoming general. The enumeration of the number of phagocytes is a laboratory method of suggesting the presence of pus, over 14,000 phagocytes suggesting, but not indicating certainly, the presence of pus locally.

In connexion with the question of immunity it is important to remember that in many cases, if the bacteria invading the body are not at once destroyed, certain of them may escape destruction either by the aggressins secreting a capsule round them or by paralysing the phagocytes. Aggressins being one of the poisons of bacterial infection, the bacteria may, in such circumstances, be said to immunize themselves.

An interesting example of this in connexion with the bacteria is syphilis. In this disease a person who has passed through the primary stage is practically immune to a fresh attack of syphilis, and yet the treponemata which escaped destruction are now very resistant microbes, and continue, in spite of the natural protective measures of the patient, further to affect him, or her, in the secondary and tertiary stages.

The knowledge thus gained of the immunity reactions may be put to practical use in the case of bacterial invasion in two ways, curative and diagnostic.

**The Curative Aspect of Immunity Reactions.**—

**Natural Immunity.**—The natural immunity of a person which is due to race, family, or age, is increased by nourishing food, temperate habits, cleanliness, fresh air, a proper amount

of exercise and rest, and a healthy environment. On the other hand, deficient nutrition, alcoholism, dirt, excessive work, unhealthy surroundings, or some chronic disease will diminish it. To take an example, the bacillus which causes pneumonia is constantly present in the mouths of healthy people without causing any harm. Supposing, however, that some person, who harbours the pneumococcus, is exposed to cold and rain for a long time, during which he has to work very hard with insufficient nourishment, then he is very liable to an attack of pneumonia.

**Artificial Immunity.**—The power of the body-cells and body-fluids to protect their owner against a disease, or to modify that disease if it is present, may be increased artificially in a passive way or in an active way.

**Passive Immunity.**—Passive immunity signifies the results obtained by supplying a patient with antibodies from the blood-serum of another animal. If the body-cells of the patient do not secrete antibodies quickly enough, or in sufficient quantities, then he, or she, succumbs. The treatment by passive immunity aims at supplying these antibodies quickly and in sufficient doses to cure the patient by having them prepared and ready for use.

Such a passive immunity may be induced—

1. By the injection of antitoxic serum.
2. By the injection of antibacterial serum.

This treatment of infectious diseases by the method of passive immunity has been successful only in a few cases, but in these such success has been attained that, if the correct antibodies could be isolated for each disease, there is no doubt success should invariably result if the patient is treated early enough.

**Production of Passive Immunity by the Injection of Antitoxic Serum.**—This method of producing passive immunity has been very successful in the case of diphtheria, and has met with some measure of success in tetanus, bacillary dysentery and scarlet fever.

The injection of diphtheritic antitoxic serum has lowered the mortality of diphtheria in a very striking way, and tracheotomy, which formerly was such a common operation to be performed for this disease, is now a rare one.



The injection of tetanus antitoxic serum, as a curative agent in tetanus, has not been nearly so successful, although the mortality of this disease, as proved in the late war, has also been lowered by this method. The reason for this comparative failure is, perhaps, that tetanus cannot be diagnosed from the local condition as can diphtheria, and so the patient is poisoned seriously before the necessity of injecting antitetanic serum is realized. As a prophylactic measure, however, the experience of the late war proved that the injection of antitetanic serum was a remedy of great value.

**Production of Passive Immunity by the Injection of Antibacterial Serum.**—This method of producing passive immunity is not nearly so successful, because there is no means of knowing whether the correct antibodies are being injected. It may be that bacteria which appear to all known tests to be identical, are in reality different. Thus there may be many varieties of streptococci, or staphylococci, although they all appear by the usual tests to be similar. The antibodies secreted by the body-cells of an animal immunized with one strain of streptococci may, therefore, be different from those immunized with another strain, although both strains appear the same.

Obviously an antibacterial serum will do good only if the person is suffering from a disease due to the same strain of bacteria. An endeavour has been made to overcome this difficulty by immunizing horses with bacteria taken from different patients suffering from the same disease, the resulting serum drawn off from their blood being given the name of *polyvalent serum*. The assumption that the theory stated above may be correct is partly justified, at any rate, since in some cases in which the injection of ordinary antibacterial serum has not caused any improvement, an injection of polyvalent serum has, apparently, led to a cure.

This method has been successful in cases of typhoid, paratyphoid, cholera, puerperal sepsis, cerebro-spinal meningitis, and gas gangrene.

**Active Immunity.**—Active immunity signifies the results obtained by stimulating the body-cells of the patient to produce their own antibodies.

Such an active immunity may be produced—

1. By a previous attack of the disease.
2. By inoculation with living bacteria.
3. By inoculation with dead bacteria.

It is not necessary here to discuss the first of these methods.

With regard to the second and third methods, they are of value mostly as prophylactic measures in the treatment of bacterial invasion since, as they take some time to bring about the desired result, the patient may have died, or recovered, from the disease before they can act.

**Production of Active Immunity by the Inoculation of Living Bacteria.**—There are two diseases only, small-pox and hydrophobia, in which the inoculation with living bacteria is still practised, but, in these, the results clearly show that in suitable cases this method is of great value. The particular microbe causing these two diseases is ultra-microscopic, so that some substance which is known to contain the causative agent, namely, the secretion from a pustule of cow-pox, or some emulsion of the spinal cord of a rabbit immunized against hydrophobia, must be used.

*Small-Pox.*—Cow-pox is supposed to be the modified form of small-pox in the cow. Some of the pustules are situated on its teats. Jenner noticed that if a milkmaid, with scratches on her hand, milked a cow suffering from cow-pox, she did not suffer beyond having a slight local inflammation on her hands and, what was so striking, she did not catch small-pox, or, if she did, she had it in a modified form. In other words, the passage of the small-pox virus through the cow alters the virus in such a way that if a human being is infected with some of this virus, a small pustule at the seat of inoculation results, and as a rule nothing more, while the individual is immune to small-pox or, if he acquires it, will only have it in a modified form.

Jenner published his discovery in 1789, a discovery leading to vaccination, which has almost stamped out small-pox in those countries in which vaccination is compulsory.

*Hydrophobia.*—The microbe causing hydrophobia is unknown; its virulence can be increased by inoculating a rabbit with an emulsion of the spinal cord of a mad dog, and then another rabbit with an emulsion of the spinal cord of the first rabbit, and so on. At one time the cord of the rabbit con-

taining the living virus was inoculated, but nowadays the cord is treated with carbolic acid to kill the virus, and graduated doses of this solution are injected into human beings which immunizes them against hydrophobia. Thus the mortality of hydrophobia has been reduced from 16 to  $\frac{1}{2}$  per cent. The treatment must be commenced early, and is successful because of the long incubation period of the bacteria (40 days).

**Production of Active Immunity by Inoculation with Dead Bacteria.**—Bacteria, from a patient suffering from an infective disease, are procured and grown under suitable conditions in an incubator, which is a kind of oven. When sufficient bacteria have grown they are mixed with normal saline and then killed by heat. The emulsion of dead bacteria is then standardized and put up in hermetically sealed glass flasks, each containing the equivalent of a certain number of bacteria, 5, 10, 20, 50, 100 million as the case may be. Persons injected with such solutions may be immunized, or partially immunized; the best-known examples being the inoculation with antityphoid serum, which has almost stamped out typhoid fever in the Army, and even in those persons who have acquired the disease the mortality has been most strikingly decreased. Similar protective inoculation is used for cholera and plague. This method has also been employed as a curative agent in puerperal sepsis and other diseases, but not so successfully, and in such cases it is considered best that the solution should be autogenous, that is, prepared from the bacteria already infecting the patient.

Unfortunately, immunization with dead bacteria is not by any means always successful. Such failures, however, are almost certainly due not to the method employed, but to the fact that the exact variety of bacteria cannot always be determined, or because the illness is due to a mixed infection, the particular bacteria causing the disease influencing the harmless bacteria which commonly frequent the body, in some way which is not known, and so causing them to become harmful.

**The Diagnostic Aspect of Immunity Reaction.**—This has already been touched upon when discussing certain of the antibodies. To give a few examples :—

The presence of typhoid and paratyphoid fevers and other



infections may be inferred if the blood-serum of the patient who is ill clumps emulsions of the bacilli causing these diseases—the *agglutinin test*. The presence of syphilis may be detected by the *Wassermann test*, which is dependent on the presence of antibodies and other substances in the blood of syphilitic patients. The question whether certain blood is human, or a particular sausage contains other than pork meat, can be detected—the *precipitin test*. The presence of suppuration can be inferred from the number of phagocytes present—the *phagocyte test*.

The foregoing remarks on immunity refer more particularly to the results of bacterial invasion.

Owing to the practical impossibility of growing pathogenic protozoa outside the body, hardly anything is known about the immunity reactions, as the result of their invasion of the body. In a few instances certain of these reactions have been found useful for diagnostic purposes, but advances have not been made in the direction of treatment on the lines of inducing passive, or active, immunity by the methods described for bacterial invasion in the previous pages.

Other methods, however, have been devised by which the protozoa circulating in the blood-stream can be killed. These methods are all concerned with the injection, into the circulation of the infected person, of a chemical poison. Their danger lies in the fact that it is extremely difficult to obtain a poison which will be strong enough to destroy the protozoa without harming the body-cells and so either killing the patient or injuring him, or her, for life. After many experiments, chemical poisons have been found which can be used with a fair margin of safety and the use of which is justified, considering the terrible nature of some of the diseases.

The chemical poison most in use at the present time is salvarsan or 606, so numbered because 605 preparations were made and discarded before a satisfactory one was discovered, and it is contended that some of its derivatives, such as neo-salvarsan, which is numbered 914, are quite safe. In the majority of cases the treatment of syphilis by this chemical poison is said to result in a cure.

Sleeping sickness has, also, been successfully treated by

chemical substances. Quinine is used as an injection for malaria, and eusol for septicæmia.

### ANAPHYLAXIS.

If a person has once been injected with a serum, for instance antidiphtheritic serum, antistreptococcic serum or antitetanic serum, and is given a second injection on another occasion with the same or some other serum, he, or she, may develop the condition known as anaphylaxis.

The word anaphylaxis means "against immunity"; that is a condition of supersensitiveness is produced by the first injection which apparently lowers the immunity of that particular individual. Anaphylaxis is a rare complication, and it is not known how long anyone who has had an injection of serum may be liable to it, but cases have been reported in which it supervened six years after the first injection. The liability to its occurrence commences after an interval of ten days from the last injection, there being no danger in repeating the injection if the interval is less than this. Rarely a person may suffer from anaphylaxis who has never before had an injection of serum.

#### SYMPTOMS AND SIGNS.—

The first indication of anaphylaxis is a swelling at the site of the injection, and this œdema may extend over the whole body but, as a rule, affects the face and eyelids only. A rash may also appear. Rarely acute and grave symptoms such as a rigor, rapid heart-beat, urgent dyspnœa and collapse follow the injection, and death has been known to occur from syncope.

#### TREATMENT.—

If on some occasion ten days or more after an injection of serum (antidiphtheritic or antitetanic) it is desired to give a person a further dose of the same or another serum, the presence or absence of the anaphylactic state must be ascertained before injecting the full dose. The doctor will thus inject very small doses, say  $\frac{1}{2}$  or 1 c.c. at intervals of half an hour for two or three doses. Then if signs of anaphylaxis do not appear, the remainder of the dose can be given with impunity.

If the complication of anaphylaxis supervenes, the doctor will probably give the patient morphia and atropine, and if necessary artificial respiration will be carried out, or oxygen administered.

NURSING.—

When a nurse is informed that a patient is going to be given an injection of serum she should ascertain, if possible, from the patient, or her relatives, whether she has ever had an injection before and for what purpose. The nurse will then be able to give such information to the doctor who may have forgotten to ask the question himself, or who had not had the opportunity of interviewing the relatives of the patient.



## CHAPTER XVII.

### INFECTION.

BEFORE describing those diseases of the genital organs due to infection, it will be well to give a short account of infection and what is meant thereby.

It is true that a very small portion only of what follows has to do with gynæcology, nevertheless infection must be treated as a whole for a nurse to realize its fundamental principles, and it is hoped that the information given will, at any rate, be of interest.

The term infection, as here used, means the communication of disease through the agency of microbes.

### MICROBES.

There is not any classification of microbes officially recognized. Beyond the fact that all bacteriologists are agreed that microbes form the lowest forms of life it is not certain whether protozoa are bacteria, the latest theory, or whether bacteria are not protozoa. The following classification is the easiest for the nurse to understand, and it is as correct as any of the others.

A microbe is a minute living body, in some cases not larger than  $\frac{1}{25000}$  of an inch across, which can be seen, if at all, only with the aid of the highest power of a microscope. It belongs to the lowest form of life, and consists of a single cell.

A microbe is either a bacterium or a protozoon. A bacterium is the lowest form of vegetable life, and consists of a single vegetable cell with a homogeneous structure. A protozoon is the lowest form of animal life. It is higher in the scale of life than a bacterium because a part of the cell, known as the nucleus, essential for life and reproduction, is recognizable as a special structure. Pathogenic microbes are those which

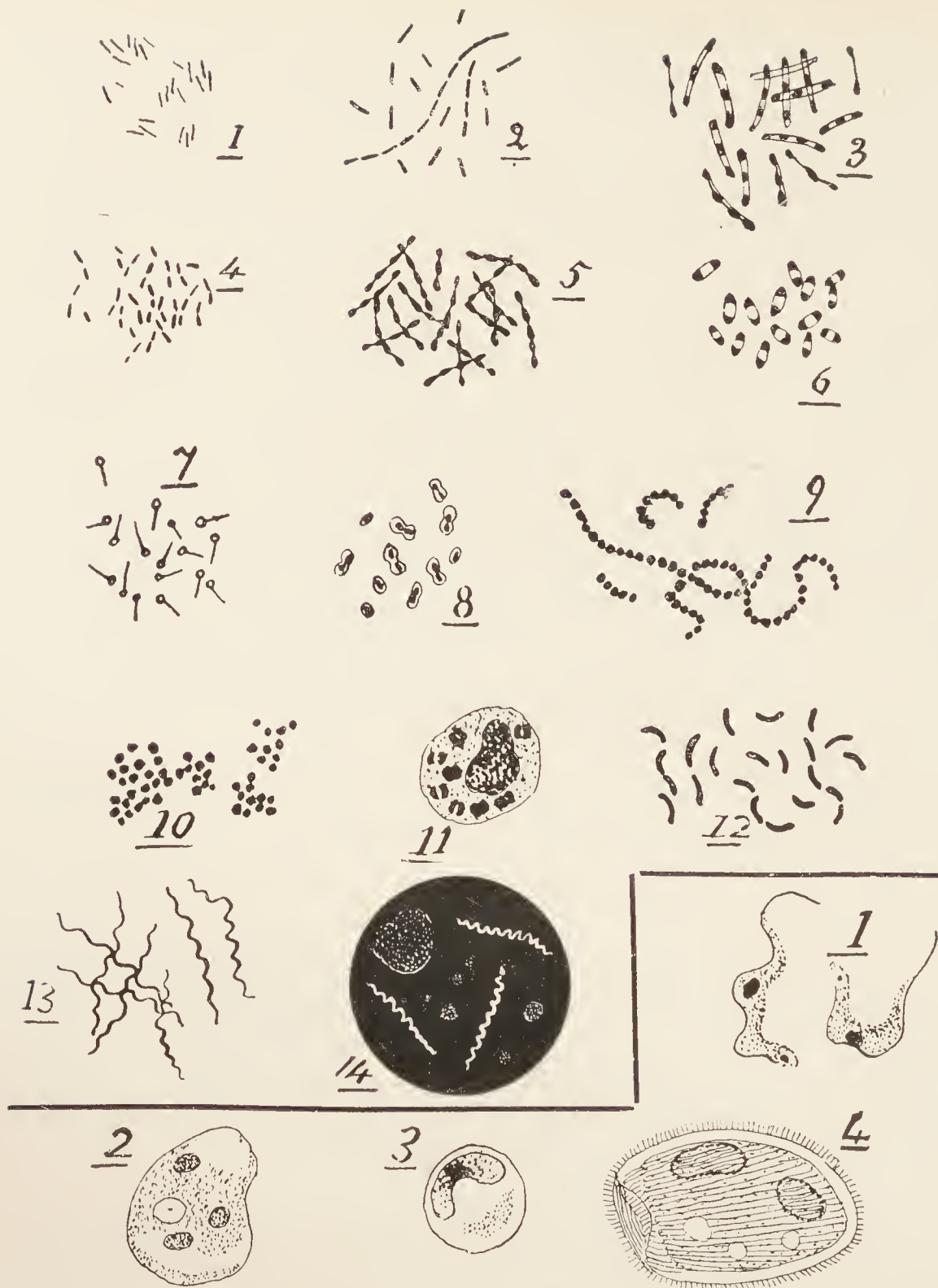


FIG. 22.—BACTERIA.

1. Tubercle ; 2. Typhoid and colon—same in appearance ; 3. Diphtheria ; 4. Influenza ; 5. Leprosy ; 6. Plague ; 7. Tetanus ; 8. Pneumococcus ; 9. Streptococcus ; 10. Staphylococcus ; 11. Gonococcus and meningococcus—same in appearance ; 12. Cholera ; 13. Relapsing fever ; 14. Treponema pallidum. The bacteria are shown inside a white blood-corpuscle, their usual situation.

FIG. 23.—PROTOZOA.

1. Trypanosome ; 2. Amœbæ of dysentery ; 3. Malaria—parasite inside a red blood-corpuscle ; 4. Balantidium coli.
- The bacteria and protozoa here depicted are not drawn to scale, but merely in a diagrammatic form to show their appearance.

affect adversely the health of animals or plants, and according to our present knowledge, there are only a comparatively few varieties that act in this way on the human body. The majority of microbes are harmless to human beings, and indeed, in the absence of some varieties of microbes, animal and vegetable life would be impossible. Microbes were first discovered some 250 years ago. The importance of microbes, however, was not appreciated till about 1850, when Pasteur proved that certain diseases were due to special kinds of bacteria. Following on this discovery, and because of it, Lister invented his method of antiseptic surgery, by which, together with the later method of aseptic surgery, such an infinite amount of suffering, and so many millions of lives, have been and will be saved.

### BACTERIA.

A bacterium can be seen only with the highest powers of the microscope. When magnified a thousand times a spherical bacterium appears about the size of a pin's head. If, however, bacteria are planted on to certain substances, such as blood-serum, broth, or potato, they flourish and multiply much as seeds do when planted in the earth. The artificial cultivation of bacteria on suitable media leads to features by which the different varieties can be recognized, either by the colour produced or the size and shape of the colonies, and it is the study of the appearance and growth-characters of bacteria which forms the science of bacteriology. Bacteria multiply at a prodigious rate, it being estimated that, under favourable conditions, a single bacterium can become a grandfather three times in one hour. Thus a single bacterium planted on to a suitable medium multiplies so rapidly that within twelve hours there appears a large colony visible to the naked eye.

**Varieties of Bacteria Pathogenic to Man.**—There are four main varieties of bacteria, and most infections are due to one or other of these organisms :—

1. Bacilli, straight or slightly curved rod-shaped organisms.  
The tubercle, colon, diphtheria, influenza, leprosy, plague, tetanus, typhoid, paratyphoid, dysentery, infantile diarrhœa, soft-sore, and whooping-cough bacilli being examples.



2. Cocci, spherical organisms. Cocci are classified as *streptococci*, which dividing form themselves into a chain ; *staphylococci*, dividing so that they form a cluster, like a bunch of grapes ; *diplococci*, dividing so as to form pairs and *sarcinæ* which divide into cubes of eight or multiples thereof. Streptococci and staphylococci, the cause of peritonitis, septicæmia, pyæmia, infective endocarditis, acute tonsillitis and other varieties of septic infections. Streptococcus, the cause of erysipelas, and staphylococcus of abscesses and boils. Diplococcus, the cause of pneumonia (pneumococcus), gonorrhœa (gonococcus), epidemic cerebro-spinal meningitis (meningococcus) and *sarcinæ*, a mould, being examples. As a rule the streptococcus is a much more deadly microbe than the staphylococcus.<sup>1</sup>
3. Spirilla or vibrios : markedly curved bacteria. The most characteristic shape is that of a comma. The spirillum of cholera is an example.
4. Treponemata : thin spiral-like microbes that have the power of motion by contracting and expanding their spirals, or by lashing and rotatory movements.

Examples are the treponema of syphilis, the relapsing fever, yaws, tic fever, yellow fever, infective jaundice, and rat-bite fever.

**Composition of Bacteria.**—Bacteria are composed of proteid substances, similar to those found in vegetable tissues, fat, salts, and water, mostly water. Each bacterium is enclosed in a membrane.

**The Toxic Products of Bacteria.**—The poisons which may affect a human being, as the result of bacterial infection, are five in number : exotoxins, endotoxins, lysins, aggressins, and ptomaines.

*Exotoxins.*—These are the commonest poisons, and they are excreted by the living bacterium through its cell wall, into the blood-stream. The most important bacteria excreting these

<sup>1</sup> Included in the cocci is a sub-group called the Brucella, consisting of : *Brucella melitensis*—Goats—Malta fever ; *Brucella abortus*—Cows ; *Brucella porci*—Pigs. These organisms are the cause of undulant fever. Human beings can be infected through the medium of the milk or manure (vegetables) of these animals.

poisons are those which cause diphtheria, tetanus and botulism, the bacterium responsible for food poisoning.

*Endotoxins*.—These poisons are derived from dead bacteria. When the bacterium dies, it disintegrates, and the poison is derived from the proteid matter escaping into the circulation. The most important bacteria, the source of this poison, are those which cause septicæmia, cholera, typhoid and paratyphoid fever.

*Lysins*.—These poisons are formed by the living bacteria, and act by digesting red blood-corpuscles. Hæmolyzing the corpuscles, as it is termed.

*Aggressins*.—These are poisons which are derived from both living and dead bacteria. They act by preventing the action of the phagocytes.

*Ptomaines*.—These poisons are formed by the action of living bacteria on dead material. The bacteria decompose the dead matter and the decomposition products are absorbed into the blood-stream. The ptomaines are responsible for the effects of eating decomposed food.

**Action of Bacteria**.—Those bacteria which are commonly found in air and water, and which will not grow at the body temperature, are mainly harmless.

Bacteria in nature are found living on dead animal and vegetable matter and, in these circumstances, are known as *saprophytes*. In such sites bacteria are harmless, and indeed they are performing a function essential for the continuance of animal life on the earth. A true saprophyte is a bacterium which causes the putrefaction and decomposition of dead animal and vegetable matter; it breaks up the dead tissue into simple compounds of carbon and nitrogen, and these compounds, finding their way into the earth, in due course are utilized by plants in the process of growing. The cycle is completed by animals eating the plants. Thus from the dead animal tissue, through the agency of bacteria, there eventually emerges food to nourish a living animal.

Saprophytic bacteria are found in enormous numbers in the lower part of the intestine of human beings and animals, and here they decompose into simple substances any of the food remnants that have escaped the action of the digestive juices. Saprophytic bacteria in their natural sites do no

harm, but many of them become parasitic when implanted into an unnatural site, such as the tissues or blood-stream of a human being. For example, the tetanus bacillus is a saprophyte found naturally in large numbers in the fæces of horses ; if a wound becomes infected with soil which has been manured, the tetanus bacillus becomes a parasitic bacterium and causes an often fatal disease.

Those bacteria which can exist and multiply only in living tissues are known as *parasitic bacteria*. Some bacteria are saprophytic at one time and parasitic at another. It is generally assumed that the parasitic form is an offspring of the saprophyte. While saprophytes are able to live in dead material, animal or vegetable, the parasitic form definitely requires living tissue. Thus, in certain circumstances, microbes harm the individual, by means of their poisons which are absorbed, without themselves gaining entrance to the tissues of the body or into the blood-stream. In other circumstances they invade the tissues or blood-stream and by means of their poisons injure the individual in this way. Why a microbe which is frequently saprophytic becomes parasitic is not known. Examples of bacteria which can be both saprophytic and parasitic are the pneumococcus and those causing sepsis ; the coccus which, living on urine, changes the urea into ammonia, thus causing cystitis, and the bacillus coli, which may be the cause of peritonitis or cystitis.

Pathogenic bacteria may remain local, or may become distributed through the tissues by the medium of the blood-stream.

The bacterial poisons act in different ways, for example, some on the nervous system, such as tetanus, some on red blood-corpuscles, some on white blood-corpuscles.

Bacteria may invade the body by contagion, ingestion, inhalation or inoculation, examples of which are the following :

1. Contagion, as in small-pox, scarlet fever, and gonorrhœa.
2. Ingestion, as in cholera, typhoid and undulant fever, through the medium of liquid or solid food.
3. Inhalation, as in diphtheria, tuberculosis, and whooping-cough.



4. Inoculation through a wound, as in general and local sepsis, and tetanus, or by the bite of a rat-flea, as in plague.

When pathogenic bacteria gain entrance into a human body, certain factors come into play which determine whether disease shall result or not.

The main factors involved are the dose of the bacteria, the virulence of the bacteria, and the resistance of the person. Thus a person may be able to overcome and destroy a small number of bacteria, but would succumb to a large dose.

Virulence means the power of bacteria to produce disease. This power may become raised by several methods, one of the commonest being the quick passing of the organism from one being to another. This accounts for the extreme danger of operating theatre or post-mortem wounds, or in those cases in which a doctor or midwife conveys septic bacteria from one patient to another. As a result of the latter, there are on record several disastrous outbreaks of puerperal sepsis, resulting in the death of many women. This factor also accounts for the increased mortality in epidemic disease. Again, the virulence of some bacteria is considerably increased if they grow in association with another variety. This is known as *symbiosis*. The cause of the increased virulence is not known. A good example is the very serious disease of influenzal pneumonia, the deaths being due to the symbiotic action of the streptococcus.

A healthy person has more resistance to disease than one who is run down, and it is the aim of all medical treatment to build up the general health of a patient. A healthy person may overcome a dose of virulent bacteria, whereas a weakly person may succumb to a small dose of fairly non-virulent bacteria.

**Universal Distribution of Bacteria.**—Wherever air and dust find entrance there can bacteria be discovered, and they are, therefore, always to be found on the skin and in the mouth and the respiratory passages. After the first few weeks of life the alimentary canal always contains millions of bacteria. Though bacteria are originally derived from foodstuffs and saliva it cannot be said that drink and food materially add to their numbers in later life. The numbers are kept up because the organisms naturally multiply in the intestine. About

one-tenth the weight of normal dried fæces is due to bacteria. The uterus, Fallopian tubes, and upper part of the vagina are normally free of bacteria, but microbes are always present on the vulva and in the lower part of the vagina.

**The Reproduction of Bacteria.**—A bacterium reproduces itself by dividing into two, then into four, then into eight, and so on, with the result that in a very short time, if there is sufficient food, moisture, and warmth available, the one bacterium will have increased to millions; in fact, only an unfavourable environment will check their indefinite increase, though in the process of multiplication many of the microbes perish.

Certain varieties of bacteria, which are nearly all included in the bacillus group, when their surroundings are not conducive to their reproduction, pass into what is called a "resting stage." In this condition the contents of the cell become transformed into an oval body known as a *spore* which has the power of retaining its vitality, even under adverse conditions, for long periods of time. In favourable circumstances the spores return to their original shape and the bacteria renew their activities. These spores are very difficult to kill, and some of them will escape destruction even when heated to a temperature higher than that of boiling water and though this high temperature be maintained for so long as fifteen minutes. Catgut, which is made from the intestines of sheep, unless specially prepared, contains large numbers of spores often of the bacillus of tetanus. Hence it is extremely difficult to sterilize catgut, and most careful tests have to be made before any batch is passed as fit for surgical use.

Bacteria, like other living organisms, require for their well-being, food, moisture, and warmth, but most of them grow better in the dark. Whether, in addition, they require free oxygen, depends upon what kind of bacteria they are. Thus there are bacteria which must have free oxygen; these are known as obligatory ærobes. Others will not grow in the presence of free oxygen but which obtain such oxygen as they require by breaking up the organic combinations of the medium in which they are growing; these are known as obligatory anærobes.

Most bacteria can grow better in the presence of oxygen,

but can do without, or with very little ; these are known as facultative anærobes and facultative ærobes.

**Food.**—Bacteria in nature find the food they require in the dead, or living, vegetable or animal matter surrounding them. In the human body the bruised and sloughing edges of any wound form a favourable site for the propagation of saprophytic bacteria, while the parasitic bacteria passing through a wound obtain nourishment from the blood-serum.

**Moisture.**—Since the food of bacteria is conveyed dissolved in water, the solution penetrating the cell membrane, they need moisture for their growth, and so are harmless if they are dry, except in the case of spores, which are able to remain uninjured for long periods, although dry. When getting ready a room in a private house for operation, therefore, unless there is time to prepare it thoroughly, clean sheets should be placed over any articles of furniture with which the nurse or doctor may come in contact.

**Temperature.**—The amount of heat required by bacteria to grow at their best varies with the different forms. High temperatures will kill these organisms, but low temperatures merely inhibit their growth. A much higher temperature is required to kill the spores of bacteria than to kill bacteria themselves. Pathogenic bacteria grow best at the body temperature.

**Light.**—Exposure to sunlight and ultra-violet rays kill most bacteria. The wisdom, therefore, of living in a room well flooded with light is obvious.

## PROTOZOA.

A protozoon can be seen only with the aid of a microscope. Protozoa, of which there are many varieties, vary in size and shape much more than do the vegetable bacteria, while to many of them are attached different shaped appendages, which enable them to move about, or perforate animal tissues in their immediate neighbourhood.

### Varieties of Protozoa Pathogenic to Man.—

Protozoa are divided into four classes :—

1. Flagellata—with a whip-like appendage.

Trypanosomes, the cause of sleeping sickness, being an example.



2. Sarcodina—without any capsule.

Amœbæ, the cause of dysentery, being an example.

3. Sporozoa—sporulating forms.

Plasmodia, the cause of malaria, being an example.

4. Ciliata—with cilia attached.

Balantidium coli, a cause of diarrhœa, being an example.

Protozoa invade the body by inoculation or ingestion.

Inoculation—either through the intact skin by the bite of a mosquito or other blood-sucking insect as in malaria, or through the mucous membrane as in syphilis.

Ingestion—through liquid or solid food, as in amœbic dysentery.

**Action of Protozoa.**—Those varieties of protozoa which are known to cause disease in man are few in number and are parasitic in nature, but there are a large number of species which are the cause of disease in animals and plants. The majority of protozoa are saprophytic.

The protozoa pathogenic to man are found in his intestine or blood.

*Intestinal Protozoa.*—The example of this is the protozoon of amœbic dysentery. There are two stages in its life-history, an active stage and a cystic stage. It is by assuming the latter stage that the amœba reproduces itself. Both stages are found in the large intestine. If the individual has sufficient resistance to the activities of the amœba, the latter forms a cyst which is evacuated with the fæces. In due course if such a cyst is swallowed it passes entire through the stomach and comes to rest in the large intestine where it develops into four active amœbæ. These amœbæ erode the blood-vessels of the mucous membrane and live on the red corpuscles. They also enter the circulation and form abscesses in the liver.

*Blood Protozoa.*—Examples of these are the plasmodia protozoon of malaria; trypanosoma, the protozoon of sleeping sickness, and Leishmania, the protozoon of Kalar-azar; infantile splenomegaly, and tropical ulcer.

**Distribution of Protozoa.**—Protozoa are distributed very widely, being found in sea water, stagnant fresh water, and in moist soils. The protozoa pathogenic to man do not

form spores. Some of them, for instance amœbæ, enter a resting phase known as *cysts*, which can exist in a damp medium such as soil, but they perish quickly if dried. Protozoal infection is not carried by air.

**Reproduction of Protozoa.**—In some species of protozoa the method of reproduction is as simple as that which obtains in bacteria, but in others it is very complicated. Thus a protozoon may be living in one animal, but in order to infect another animal the parasite has to be conveyed to it by the bite of an insect which has sucked up some of the blood of the first animal together with some of the parasites. The parasitic protozoa of amœbic dysentery and malaria live on red corpuscles. The exact method of reproduction of protozoa is known only in the case of malaria.

Very briefly, and for the most part in unscientific language, this is what occurs. For the parasite, which is conveyed by the bite of an anopheles mosquito, to reproduce itself it has to spend part of its life in the blood-corpuscles of a human being, and this is known as the asexual cycle. The other part of its life is spent in the body of a female mosquito, and this is known as the sexual cycle.

We will take the case of a female infected mosquito which bites a human being who has never had malaria. The mosquito carries in its salivary glands certain small round bodies called *sporozites*. These bodies are injected into the blood of the human being and enter the red blood-corpuscles, and develop into amœbulæ. When the blood-corpuscles become too full they burst and the amœbulæ escape into the blood-stream and there develop into two different bodies, the one into sporozites which, as before, enter more red blood-corpuscles, these being asexual, and the other into *gametocytes* which are the sexual bodies. So far as the human being is concerned, the malaria can continue indefinitely; if not cured, the sporozites again becoming amœbulæ and then sporozites and so on.

The gametocytes are sucked up from the blood of the infected person by another mosquito (female), and when they get into its intestinal canal, the male gametocyte fertilizes the female gametocyte. The female fertilized gametocyte now bores its way into the stomach-wall of the mosquito and there developing into sporozites, the latter burst into the stomach

and make their way to the salivary glands of the mosquito, to infect a new human being if opportunity occurs.

The time occupied by the asexual cycle varies with the variety of the anopheles. The fever appears with the bursting of the amœbulæ out of the red blood-corpuscles. This in the quartan malarial fever takes three days and in the tertian fever and malignant tertian fever it takes two days. The time taken by the sexual cycle varies from 10 to 16 days according to the variety of the anopheles.

The remaining protozoa probably also have two cycles, one occurring in the bodies of certain animals, as for instance in the case of sleeping sickness, due to the infection of the protozoa by the tsetse fly.

### FILTER PASSING ORGANISMS.

The bacteria causing certain infectious diseases are so small that they cannot be seen even with the highest powers of the microscope, and so are called ultra-microscopic. They are so small that the smallest pores of an earthenware filter allow them to pass through.

These diseases include, among others—

Small-pox, Encephalitis lethargica, Measles, Mumps, Hydrophobia, Infantile paralysis, Yellow fever, Typhus and Influenza.

That such diseases are due to ultra-microscopic microbes seems to admit of very little doubt for the following reasons :—

1. Some of these diseases can be transmitted to a healthy animal by injecting into it blood, or secretion, from an animal known to be suffering from the disease. If this blood, or secretion, is first heated to a certain temperature, however, it has no effect when injected. Obviously, therefore, some living substance has been destroyed by the heat.
2. The disease can be transmitted, although the blood, or secretion, has been passed through a porcelain filter with such small holes that these would prevent the passage of the smallest microbe visible by the microscope. Therefore the disease cannot be due to any microbe which can be seen by the microscope.
3. All the diseases are highly contagious or infectious.



## PART XII.

### INFECTION OF THE FEMALE GENITAL AND URINARY TRACT.

#### CHAPTER XVIII.

##### INFECTION OF THE FEMALE GENITAL TRACT.

THE channels of infection are four: the vulva and vagina, the bowel, the urethra, and bladder.

Inflammatory disease of the genital tract is responsible for more suffering and disablement, and the loss of more lives than any other disease of a gynæcological nature. It is the most frequent cause of sterility in women.

The serious danger of infection, of any one portion of the genital tract in a woman, is due to the marked tendency it has to spread to other portions, and since her genital apparatus forms a patent canal, one end of which opens outside her body and the other end into her peritoneal cavity, the great danger to life that may result from such an infection is obvious. Since there is no opening into the peritoneal cavity of the male, inflammation of his genital organs has not the same dangers or disabilities.

**Vulva and Vagina.**—The infection may spread along the mucous membrane lining the genital canal, when the following diseases may result (Fig. 24):—

Vulvitis.

Bartholinian abscess.

Vaginitis.

Endometritis.

Salpingitis.

Ovaritis and ovarian abscess.

Pelvic peritonitis.

General peritonitis.

If the vagina, or uterus, is injured then the infection may spread, *via* the lymphatics, through the walls of these organs

to the cellular tissue, giving rise to pelvic cellulitis. Again, the infection instead of spreading along the mucous membrane

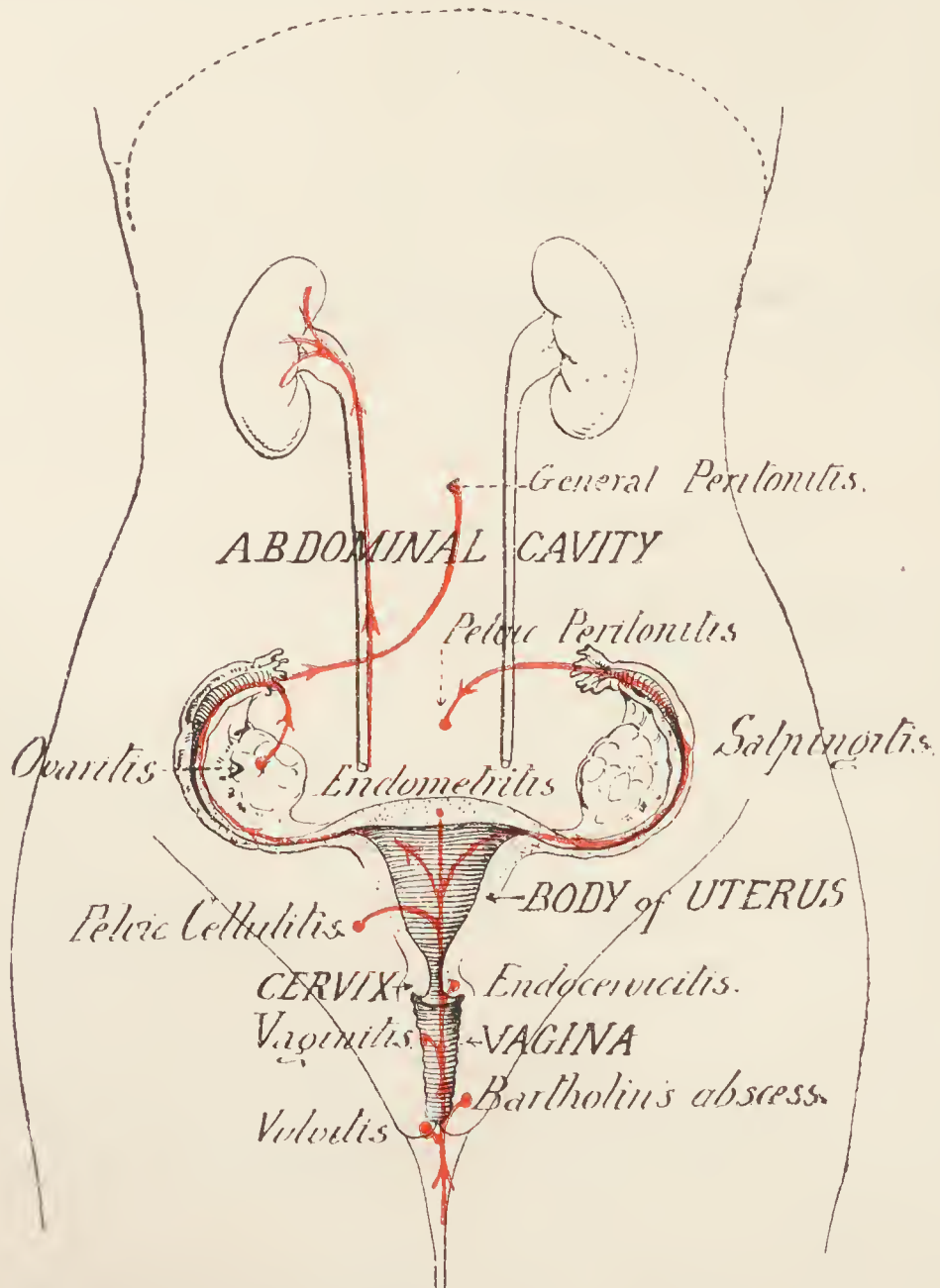


FIG. 24.—Diagram showing the path of infection from the vulva to the peritoneal cavity, and the various diseases that may result. The ureters are cut short, and the kidneys are depicted showing the path of infection that may result from an attack of cystitis, causing ureteritis, pyelitis and pyo-nephritis.

or into the cellular tissue, may extend along the veins of the pelvis giving rise to septicæmia or pyæmia.

The inflammation, although it very often does so, need not necessarily start at the vulva or vagina. It may start

in the uterus, as in the case of puerperal sepsis, when the placental site, or some uterine laceration, becomes infected by bacteria spreading from the vagina or vulva.

**The Bowel.**—An inflamed appendix may infect the right Fallopian tube. The rectum may become adherent to the back of the uterus; a coil of intestine may become adherent to a fibroid tumour of the uterus, or to an ovarian cyst, as the result of infection *via* the bowel.

**The Bladder and Urethra.**—Fig. 18 shows the path of infection to the kidney *via* the ureter, resulting in pyelitis and pyelo-nephritis. The infection starting in the urethra or bladder, such conditions are not strictly gynæcological, but are associated at times with diseases peculiar to women.

### Vulvitis.

Vulvitis may be acute or chronic.

#### CAUSE.—

The common cause of acute vulvitis is gonorrhœa. There are other causes such as streptococcal infection, diphtheria, thrush, and the acute specific fevers, but all these, in comparison, are very rare. Chronic vulvitis may be a sequel to the acute variety; other and commoner causes are those of a very acid or diabetic urine, irritating vaginal discharges, and uncleanness.

#### SYMPTOMS AND SIGNS.—

A patient suffering from acute vulvitis complains of great pain on walking or sitting, and may be unable to do either. The vulva is very swollen, perhaps more on one side than the other, owing to the presence of a Bartholin's abscess, and painful micturition may be complained of owing to an associated urethritis. There is a profuse purulent discharge. The inguinal glands become swollen and painful. The vulvitis of diphtheria and thrush is characterized by the presence of membranes on the vulva, and that of the acute specific fevers by gangrene (*noma pudendi*). In chronic vulvitis the surfaces of the vulva are red and often eczematous, due to the fact that the patient is impelled to scratch the parts because of the intense irritation.



**TREATMENT.—**

Frequent warm baths followed by the application to the vulva of hot fomentations wrung out in hot lead lotion. Douching is inadvisable owing to the certainty that some of the microbes will be carried into the vagina and perhaps, therefore, infect the rest of the genital tract. In chronic vulvitis due to irritating discharges, constant changes of the pads, extreme cleanliness and the application of an ointment, such as equal parts of zinc ointment and castor oil, will be found very beneficial.

**Bartholinian Abscess.****CAUSE.—**

This is most commonly due to infection of Bartholin's gland by the gonococcus. It may rarely be due to streptococcal infection, and sometimes follows an injury to a cyst of Bartholin.

**SYMPTOMS AND SIGNS.—**

Very great pain on walking or sitting.

Pain, heat and tenderness in the swelling.

Redness and œdema of the parts surrounding the swelling which is in one or other labium majus, or rarely in both.

**TREATMENT.—**

The abscess will be treated by incision, followed by scraping, and swabbing the interior of the abscess cavity with pure carbolic acid. The cavity is then packed with gauze, and the nurse will be directed to apply hot fomentations if there is much œdema.

**VAGINITIS.****CAUSE.—**

The vagina being lined by squamous epithelium and being practically devoid of glands, is not a common site of inflammation.

Inflammation of the vagina may be due to—

Gonorrhœa, more especially in children and pregnant women; infection following labour, abortion, or a vaginal operation, or irritation of a foreign body, commonly a neglected pessary, more rarely a fibroid polypus.

The chemicals in an antiseptic vaginal douche being too strong or the water too hot.

Infection associated with the acute specific fevers, or due to bacillus coli.

Advancing years—senile vaginitis.

#### SYMPTOMS AND SIGNS.—

Feeling of heat and pain in the vagina.

A purulent discharge which may be offensive.

The colour of the lining of the vagina is much redder than normal.

Simple vaginitis is not a very troublesome disease, and a few days' rest in bed, together with vaginal douches, is generally sufficient to cure it.

Gonorrhœal vaginitis, however, is a much more serious condition. Unless efficiently treated, it is dangerous because it may spread up through the uterus into the Fallopian tubes, thence to the peritoneum, and so cause death from general peritonitis—this is rare. More commonly the inflammation stops at the Fallopian tubes, the salpingitis perhaps terminating in a pyosalpinx. In fact, after sepsis following labour or abortion, gonorrhœa is by far the commonest cause of salpingitis and its attendant ills, especially sterility.

There are some marked differences in the symptoms and signs between a simple and gonorrhœal vaginitis, and from these alone a very shrewd idea may be gathered as to the cause (see p. 203).

#### TREATMENT.—

Apart from dealing with the cause itself, which will be the duty of the doctor, the nurse will be directed to give douches or to insert tampons or suppositories containing antiseptics or astringents into the vagina.

### ENDOMETRITIS.

Inflammation of the lining membrane of the uterus is, in all cases, the result of bacterial infection. As a rule the organism is a streptococcus or the gonococcus, but the infection may be due to other bacteria.

## CAUSE.—

In nearly all cases the inflammation is due to puerperal or gonorrhœal infection, or to infection following an operation upon the vagina, the bacteria gaining entrance into the interior of the uterus. Puerperal infection is the commonest. More rarely endometritis may occur as a complication of one of the zymotic diseases.

## SYMPTOMS AND SIGNS.—

In the acute puerperal variety the symptoms are of great severity. The temperature rises rapidly and there may be a rigor accompanying it. The pulse-rate is quick, and the patient is very ill and complains of abdominal pain. There is a purulent discharge, which is very irritating in character, and the uterus is enlarged and tender. The further symptoms depend upon the progress of the case. The infection may remain localized or spread to the cellular tissue or peritoneum, and septicæmia not infrequently results.

If the endometritis is due to a gonorrhœal infection the general symptoms are, as a rule, not so severe. There is a profuse purulent discharge, which is very irritating, and an increase in the amount of menstrual loss, while menstruation often becomes irregular.

## TREATMENT.—

The treatment of acute endometritis will depend partly on the nature of the infecting organism. In cases of puerperal infection the injection into the uterus of sterilized glycerine is of value. Intra-uterine douches are contraindicated.

**CHRONIC METRITIS.**

In 95 per cent. of cases this is a condition of the uterus due to infection in most cases following labour or abortion. In 5 per cent. of cases the patients are virgins or nulliparous, and in these there is not any indication that the cause was bacterial. It is not a particularly uncommon condition.

## SYMPTOMS AND SIGNS.—

Dysmenorrhœa and excessive menstrual hæmorrhage are the most striking symptoms and the uterus is enlarged. The loss at the period gradually increases and at length is so great that the patient is permanently invalided.



## TREATMENT.—

The treatment by drugs and by curetting is simply a waste of time and money, although, as a rule, drug after drug is tried and the curetting is repeated. The reason why such treatment is useless is because there is a marked increase of elastic tissue. Normally menstruation is accompanied by contractions of the uterus by which means the flow is gradually stopped. In chronic metritis the excess of elastic tissue leads to very inefficient contractions and so the loss continues much longer till clotting takes place. Formerly the only successful treatment for this condition was hysterectomy. Nowadays it is cured by the insertion of radium into the uterus.

## SUBINVOLUTION.

## CAUSE.—

The chief cause is deficient uterine contraction and retraction after labour or miscarriage, due to the retention of portions of the placenta, chorion or blood clot, or to the presence of a fibroid in the uterus. Backward displacement of the puerperal uterus is also a cause.

## SYMPTOMS AND SIGNS.—

Excessive menstrual loss, backache and a leucorrhœal discharge. The uterus being larger there is a greater surface of endometrium to bleed and discharge.

## TREATMENT.—

The doctor will probably prescribe some preparation of ergot and calcium lactate. If this drug treatment fails he will curette the uterus. Curettage of the body of the uterus for most conditions associated with hæmorrhage and discharge is quite useless and often harmful. If there is one condition in which it is of use, it is that of subinvolution of the uterus.

## SENILE ENDOMETRITIS.

## CAUSE.—

Bacterial infection in women past the menopause.

## SYMPTOMS AND SIGNS.—

A purulent, blood-stained, offensive discharge. Some pelvic pain is generally complained of. Pus at times collects in the

uterus, thus forming a pyometra, when the patient will have toxæmic symptoms in addition.

Considering the age of the patient, the symptoms described are generally due to cancer.

#### TREATMENT.—

Before treating such a case the doctor will make sure that cancer is not present. Senile endometritis is treated by curettage, by draining the uterus if a pyometra is present or by removing the uterus.

### HÆMATOMETRA.

A condition in which the uterus is distended with blood. This may be due to the vagina, or part of the vagina or the cervical canal, being absent from a congenital cause, or the cervical canal may be closed by adhesions. In these circumstances the menstrual blood collects in the uterus. The cervical canal may also be obstructed by cancer.

### PYOMETRA.

A condition in which the uterus is distended with pus, the cervical canal being closed by cancer or inflammation. Pyometra may also be present with cancer of the uterus, and senile endometritis without the cervical canal being closed. The patient has an intermittent and most offensive discharge and symptoms of septic absorption are at times present.

### SALPINGITIS.

Of the serious diseases that are peculiar to women, salpingitis, or inflammation of the Fallopian tubes, occurs most frequently. In such cases the ovaries are almost always involved, and in them the inflammation may go on to pus-formation so that an ovarian abscess results. If the abscess in the ovary communicates with the Fallopian tube, as it most often does, the condition is called a tubo-ovarian abscess.

#### CAUSE.—

Sepsis following labour or abortion; gonorrhœa; the use of infected instruments (sounds, dilators); sloughing fibroids; cancer of the uterus; tubercle.

The large majority of cases of salpingitis are due to the first two causes.

Salpingitis is much commoner among the poor than the rich, in fact, it is a comparatively rare disease among the well-to-do, the reason being obvious.

The disease is due to a microbe which, in most cases, first causes an endometritis and then infects the Fallopian tubes. The tubes may then become merely inflamed (salpingitis) or their abdominal opening may become closed and pus collect (pyosalpinx).

The inflammation often spreads from the Fallopian tubes to the surrounding structures and, rarely, acute general peritonitis may supervene with a fatal result.

More commonly the intestine, ovaries, Fallopian tubes and uterus become bound together and fixed by adhesions due to local peritonitis and, because of these adhesions, the removal of the diseased structures, later on, may be very dangerous and difficult.

#### SYMPTOMS AND SIGNS.—

The symptoms depend mostly on whether the condition is acute or chronic.

**Acute.**—In this instance the onset is sudden, the temperature rises to a high degree ( $103^{\circ}$  F. or more), the illness may be ushered in by a rigor, and the patient complains of severe abdominal pain and perhaps painful micturition. The abdomen is distended and very tender. The abdominal symptoms are due to the infection spreading from the Fallopian tube to the peritoneum before its fimbriated end is sealed by the inflammation.

**Chronic.**—The chronic cases are much the commoner. In these the inflammation gradually spreads through the walls of the Fallopian tube, their abdominal openings having been closed. The patient complains of menorrhagia, metrorrhagia, dysmenorrhœa, leucorrhœa, painful defæcation, dyspareunia and perhaps a frequency of micturition. Salpingitis is a very common cause of sterility or of one child sterility. It is for this reason that prostitutes so seldom become pregnant.

A usual history in cases of chronic salpingitis, especially when there is pus present, is that the patient has for years been living the life of a semi-invalid, and hardly, if ever, feels



quite well, is unable to do much work, and any extra exertion is likely to bring on what she calls an attack of "inflammation of the bowels," for which she has to go to bed for a few days. These attacks, which gradually increase in frequency, are due to the fact that microbes have escaped from the Fallopian tube and are setting up fresh inflammation.

A pyosalpinx may in some cases reach the size of a banana or even larger and may rupture into the abdominal cavity and cause general peritonitis, or it may rupture into the rectum, bladder, or vagina, giving rise to great misery.

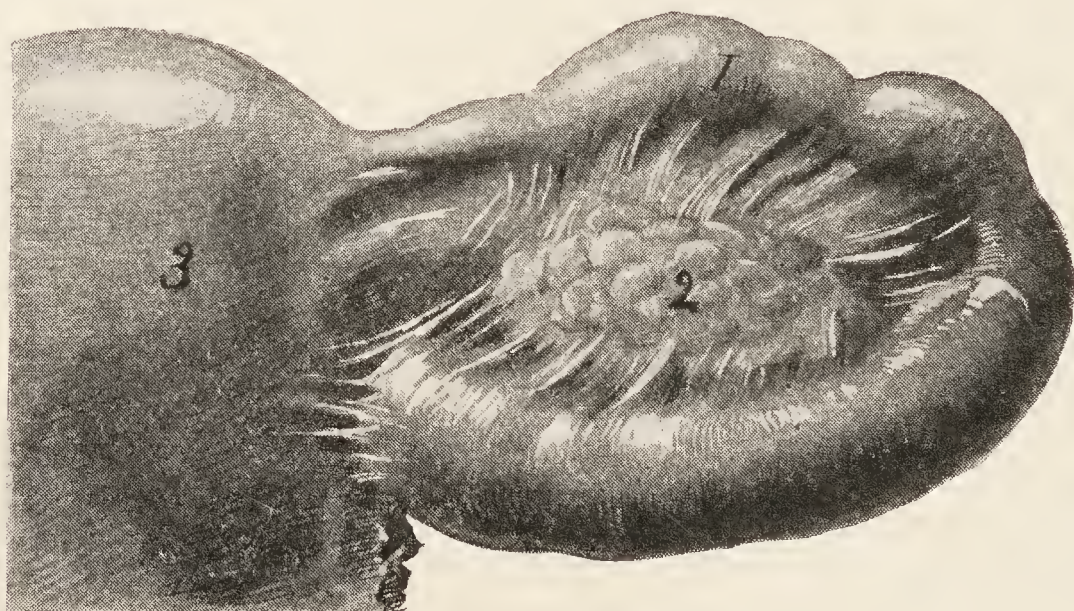


FIG. 25.—Diseased Fallopian tube. Salpingitis. 1. Fallopian tube distended and matted with adhesions ; 2. Ovary ; 3. Uterus.

#### TREATMENT.—

In the acute variety, when general peritonitis is present in addition, an operation must be performed and the diseased tubes removed and the abdominal cavity drained. If the peritonitis is only local many authorities think it is safer to wait till the inflammation has quieted down before operating, and in a certain percentage of such cases the disease clears up.

The treatment of the chronic form will depend upon the history and the condition found on local examination. If there have been several attacks of inflammation, then the surgeon will certainly decide to operate.

## OVARITIS, OVARIAN ABSCESS.

The ovary may be infected by organisms passing through the wall of the Fallopian tube or through its abdominal orifice, or the ovary may be infected by a diseased appendix. The infection may be so acute that an abscess forms in the ovary. This abscess may communicate with the Fallopian tube, in which case a tubo-ovarian abscess is formed.

So far as the nurse is concerned, the signs, symptoms, sequelæ, and treatment are those of salpingitis.

## GENERAL PERITONITIS.

For the description of this condition, which may be due to the same causes as those mentioned under pelvic peritonitis, the reader is referred to page 424.

## PELVIC PERITONITIS.

Pelvic peritonitis signifies inflammation of the peritoneum which lines the pelvic cavity and covers the organs contained therein.

### CAUSE.—

The peritoneum may become infected by direct extension along the genital canal, the commonest causes of which are septic infection following labour or abortion, and gonorrhœa. Other rarer causes are sloughing fibroids and cancer.

The pelvic peritoneum may also become directly infected by a diseased vermiform appendix.

### SYMPTOMS AND SIGNS.—

In the acute stage the patient has very great abdominal pain, and is unable to bear the weight of the bedclothes. She has the symptoms of fever, and often complains of great pain on micturition, due to the movement of the inflamed peritoneum covering the bladder, this pain may on occasion be the cause of retention of urine.

The abdomen is distended, rigid, and tender. The breathing is thoracic, and the patient lies with her legs drawn up. The temperature and pulse-rate are raised.

### RESULTS.—

1. The disease may end in absorption of the inflammatory products, and complete recovery.



2. An abscess may form, and after a severe illness, unless properly treated by operative measures, the pus escapes by ulceration into the bowel, bladder, or vagina. More rarely, the patient dies.

3. The inflammatory products may become organized into fibrous tissue (adhesions), which bind together the pelvic viscera, and cause trouble for years after. A common termination.

#### TREATMENT.—

Hot douches, abdominal fomentations, and drugs to relieve the pain and regulate the temperature may be prescribed.

With the knowledge, however, that pelvic peritonitis is generally due to appendicitis or salpingitis, many surgeons operate forthwith.

### PELVIC CELLULITIS.

#### CAUSES.—

Inflammation of the cellular tissue of the pelvis is nearly always due to infection of some wound caused by labour, generally a laceration of the cervix : it may follow an operation on the genital organs.

#### SYMPTOMS AND SIGNS.—

These correspond to those of pelvic peritonitis, but in an average case they are not so severe. Moreover, the tenderness and abdominal pain is much more local, occurring on one or other side just above the groin, and it is in this situation in cases following labour that a hard swelling appears.

#### RESULTS.—

1. The disease may end in absorption when the patient recovers without any bad symptoms.

2. In at least half the cases an abscess results, which, if not opened through the abdominal wall, bursts after about two months, as a rule, just above the groin, in which case the patient will not be well for four or five months.

3. Organization may result when the inflamed tissue becomes fibrous, and fixing the uterus may cause trouble for years after.

#### TREATMENT.—

Cases of pelvic cellulitis are treated by the palliative measures indicated under pelvic peritonitis. When there is any indication that pus is present an incision will be made at the appropriate spot.



## CHAPTER XIX.

### SEPTICÆMIA.

SEPTICÆMIA is a disease due to microbes, generally hæmolytic streptococci, gaining entrance to the blood-stream and therein undergoing extremely rapid reproduction. The microbes are able to live, and multiply, because their surroundings, which are moist, dark and of the temperature of the body, are entirely favourable, while the best food for which they could wish is present in the serum of the blood. On the entrance of these microbes into the blood certain white corpuscles of the blood, known as phagocytes, attack them and eat them. Unfortunately, however, unlike soldiers in a battle, the majority of whom survive, these soldiers of the body which have eaten the microbe then die. As the microbe disintegrates, a poison, the endotoxin, is formed, and being absorbed by the tissues, is the cause of the illness of the patient. Whether the patient dies or not depends on the quantity of endotoxin absorbed and the efficacy of the remaining defensive powers of the body.

#### SYMPTOMS.—

The patient feels ill, complains of headache and of inability to assume any position that is entirely comfortable, so that turning about from one side to another she is deprived very often of that amount of sleep that is conducive to her recovery. The attack, if the temperature rises suddenly, may be accompanied by the distressing symptom of a rigor which makes the patient very exhausted. If the temperature rises more slowly the initial rigor may be absent though, as the disease progresses, repeated rigors even in the absence of pus formation (pyæmia) may occur. The patient, when not sweating, feels hot and dry and complains of thirst, partly because she may be disinclined to drink as much fluid as she should, and partly

because of the profuse sweatings which occur. She complains of feeling weak, and this complaint is intensified as time goes on. She often has a great distaste for food and may complain of terrifying dreams.

SIGNS.—

The patient is restless, her temperature often varies markedly, since in the morning it may be as low as 99° F. and in the evening as high as 104° F., quite apart from the serious rise and fall accompanying a rigor. The pulse-rate is often 100, may rise to 130 or 140, and while at first the pulse is full and bounding, as time goes on it becomes smaller and its rate more rapid and irregular. She suffers from profuse sweating, apart from the rigors, and may have an irritating heat rash. Her tongue is dry and coated, and either brown and cracked or red and shining, and sordes are apt to collect on the lips. At the commencement of the attack the patient may vomit and this symptom, if the disease is prolonged, may return. Her urine is scanty and high coloured, and if the kidneys are affected will contain some amount of albumin. The loss of flesh is noticeable, and with the disease going from bad to worse, the patient becomes listless, sinks down in the bed and is delirious at night. Diarrhœa, a distended abdomen and hiccough may supervene and in themselves are bad signs.

**Pyæmia.**—During the course of the illness pyæmia, which indicates the formation of local abscesses, may be superadded to the septicæmia. Pyæmia is due to part of a septic thrombus breaking off the clot, and being carried by the blood-stream till at last it arrives at some part in the body where the blood-vessels are so small that its progress is arrested. Suppuration then takes place at this spot and an abscess is formed. The commonest sites for such abscesses are in the joints, pleural cavities, and kidneys, as in these situations the vessels are very small. Abscesses may also form in the subcutaneous tissue or in that between the muscles. The arrest of such an embolism may be heralded by the patient complaining of a sudden pain in some portion of her body, but this is not always so, and an abscess may form without the doctor, nurse or patient, in the first instance, being aware of the fact. Pyæmia is generally accompanied by a series of rigors which, in a few days, are followed by the appearance of abscesses, but not always so,

and, as already mentioned, the appearance of such abscesses may be very insidious.

TREATMENT.—

At the commencement of a case of septicæmia the doctor will probably give injections of anti-streptococcic serum, unless he is certain that the infective organism is of some other variety, and he may follow this by intravenous injections of some drug. As the case becomes chronic he may try the effect of vaccines though, as a rule, these are not very successful. If any abscesses form he will open them. Otherwise all his energies will be devoted to encouraging the vitality of the patient in the hope that her body-cells and body-fluids will together destroy the microbes and their poisons.

The treatment of septicæmia depends a very great deal on the nurse since, as will be seen hereafter, the nurse will have herself to carry out most of the remedies the doctor orders. The subject of diet is dealt with under nursing. Most doctors will prescribe a certain amount of alcohol. The worst case the author ever saw was that of a lady who was removed from a Twilight Sleep Home. She was in bed altogether sixteen weeks. During this time she had repeated rigors, abscesses in several joints of her limbs, which had to be opened, including one which destroyed her hip joint. She had abscesses in her muscles which were opened, an abscess in the region of her trachea which nearly suffocated her, one eyeball was destroyed and had to be removed, and later she had to have a resection of her hip. This patient was determined to get well, eat everything she was asked to, and drank a bottle of champagne a day and over a bottle of brandy a week. The author is convinced that it was the food and alcohol that enabled her to resist successfully the infection, though some might contend that as regards the alcohol the recovery took place not because of it but in spite of it. At any rate the great pain and collapse following a dressing of the abscesses necessitated the administration of a stimulant. Perhaps the alcohol did more good because, up to the time of her illness, the patient was a teetotaler.

If any abscesses form the doctor will have to open them, and the nurse must be ready with the necessary dressings and appliances, other than those the doctor provides. The



bowels will require constant attention, as very often these patients are constipated, necessitating the administration of aperients, while on the other hand diarrhœa may supervene, a bad sign, which the doctor will treat, and in these cases the nurse has to be most careful in keeping the patient scrupulously clean, since if the discharges are not carefully removed they will increase the chances of bed-sores very greatly. The doctor will also be called upon to prescribe for headache and sleeplessness.

In some cases one or other of the joints will become inflamed, or some other part of the body, without the formation of an abscess. The pain resulting can be relieved by hot fomentations or turpentine stupes and, if there is inflammation in the pelvis, hot douches, 115° F., will be found very useful. The skin on the inner surfaces of the thighs in some women is very tender, and the repeated administration of douches at this temperature will often cause great discomfort, or even severe pain and soreness. Such a complication can be avoided by smearing the vulva and inner surfaces of the thighs and buttocks with vaseline or zinc ointment.

#### NURSING.—

The principal object in the treatment of septicæmia is to make every effort to assist the body-cells and body-fluids of the patient in their endeavour to modify the disease or destroy the invading bacteria by the production of acquired immunity. So far as the nurse is concerned this means that she must do everything in her power to encourage the patient to take sufficient nourishment, and in this case sufficient nourishment means as much as the patient can take without upsetting her digestion. It is a well-known fact to medical men that, taking all cases, those patients suffering from septicæmia who consume the most nourishment do the best. It may require constant endeavour, much patience, and great tact on the part of the nurse to persuade the patient to take the proper amount of nourishment but, in most cases, if the nurse is a good one, this can be done. The doctor will direct the nurse, in the main, what food to give the patient, but the nurse herself should be of the greatest value in this respect, by suggesting various articles of food and changing the diet at fairly frequent intervals.

In the case of an acute illness accompanied by fever the natural functions of the body, including digestion, are upset, and it is therefore necessary to give such patients liquid diet of a very digestible character. Moreover, many of the articles given as liquid diet are only stimulating, and have but very little or no nourishing properties. If septicæmia does not lead to a fatal termination in a week or two the patient is in many cases a long time, perhaps several weeks, before she gets well. During this time the patient may have a high and irregular temperature. In such cases patients may have any article of diet they fancy, within reason, and, as a rule, they are able quite well to digest solid food of a suitable character.

It is very important that such a patient should sleep well ; the ability to take nourishment will favour this, and also the more comfortable the nurse makes the patient, the more likely is the latter to get proper rest. The mouth will probably be very dry, and dead epithelium is apt to accumulate on the lips. The nurse, therefore, should be very careful to keep the teeth and mouth as clean as possible by brushing and gently washing them with glycothymoline, while the patient should be encouraged to wash out her mouth at frequent intervals with some mild antiseptic such as boracic acid lotion. If the lips are cracked a solution of glycerine of borax will be found very useful.

The room must be kept well aired, and so long as the patient is properly protected with screens and kept warm, it is best to have the window open. If possible a room should be chosen into which the sun, if there is any, can penetrate. In the summer, if the patient is well wrapped up and kept warm with well covered hot-water bottles, her bed may be wheeled to an open window, or balcony, or even into the garden where she will get the maximum amount of sun and fresh air.

As septicæmia depresses the resisting powers of the patient very much and the patient may be a long time in bed, sores are apt to form on the back and especially over any bony prominences such as the sacrum and hip bones, and the nurse must be most constant and energetic in her treatment of these surfaces every day. If possible the patient should have a water bed to lie upon, and her legs should be moved

daily as they are very apt to get stiff, and the position of the patient should be changed frequently.

The nurse when she is attending to the patient must be careful to notice, from day to day, whether there is any soft swelling (abscess) in the subcutaneous tissues. The nurse is much more likely to discover such a swelling, which often appears without pain, than the doctor. An early report thereof to the doctor may save the patient much suffering.

The distressing symptom known as a rigor may leave the patient exhausted. The sudden rise in temperature causes the patient to feel cold and the shivering is very distressing. At this time hot-water bottles and an extra blanket should be provided and the patient should be given a little alcohol in hot milk or water. After the attack has passed off the patient will feel very hot and the hot-water bottles and extra clothing will have to be removed. With the fall of the temperature the patient will perspire profusely. Her nightgown will become wringing wet and perhaps the sheets. The nurse should make the patient as comfortable as possible by removing her nightgown, carefully drying her body, and putting on a clean nightgown and fresh bed-linen when necessary. If the temperature keeps high the doctor may order the nurse to sponge the patient or give her a cold pack—the method of so doing she will have learned in her general training.

The nurse must remember that if the microbe from which the patient is suffering has a chance of infecting herself, she too may get septicæmia. This will only happen if the nurse is careless in not protecting her hands if she has any scratches on them. The best way to protect the hands is to wash them carefully before and after attending to the patient, soaking them in some antiseptic such as lysol after the washing with soap and water, and to wear rubber gloves if the patient has any abscess discharging, or discharge from the genital passages.

The well-being and comfort of a patient suffering from septicæmia, and her recovery, will be due as much to the attention of the nurse as to that of the doctor. The patient must be kept as cheerful as possible, and much patience and an ability to pay the greatest attention to the smallest details, apart from sound professional knowledge, is required of any woman who undertakes to nurse a patient suffering from septicæmia.



## CHAPTER XX.

### SYPHILIS—GONORRHŒA—SOFT SORE.

#### SYPHILIS.

SYPHILIS may be acquired, hereditary or congenital. We are here dealing only with the acquired variety.

Syphilis is a contagious disease and, if untreated or if the right treatment is neglected, may last several years.

It was estimated by the Royal Commission on Venereal Diseases that not less than 10 per cent. of the whole population was infected with syphilis, and that 17 per cent. of the insane persons, 34 per cent. of people blind from birth, and 25 per cent. of persons deaf from birth, owe their affliction to syphilis.

Syphilis is the chief cause of paralytic strokes occurring before middle age ; it leads to the birth of diseased children, many of whom die in childhood ; it is responsible for a large proportion of still-births, and it is a common cause of softening of the brain.

#### CAUSE.—

Syphilis is due to infection by the *treponema pallidum*. The infection may be direct or indirect. If the microbe is implanted in some part of the body of a healthy person where there is an abrasion by actual contact with a person suffering from syphilis, the infection is direct. A person may be indirectly infected by using cups, mugs, spoons, forks, sponges, towels, or other articles before they were sterilized, which have been used by a syphilitic person. The site of inoculation is usually some part of the genital organs, more rarely the lips, throat or fingers.

## COURSE.—

When left untreated, or inefficiently treated, syphilis passes through three stages, known as the primary, secondary, and tertiary. Primary and secondary syphilis are infectious, tertiary not. Between the time of infection and the appearance of the tertiary signs, there are three intervals of time, during which the patient may be unaware that he or she has the disease. During the first two intervals the patient is infectious, during the third generally not.

## FIRST INTERVAL.—

Between the date of infection and the appearance of the primary lesion. This is called the incubation period and averages about seven weeks.

## SECOND INTERVAL.—

Between the development of the primary lesion and the appearance of the secondary lesions. During this period, which averages four to eight weeks, the disease is becoming disseminated through the system.

## THIRD INTERVAL.—

Between the disappearance of the secondary lesions to the appearance of the tertiary. During this interval, which varies from three to many years, the disease has become chronic.

### Primary Syphilis.

## SYMPTOMS AND SIGNS.—

The first symptom generally noted is irritation at the site of infection ; in women this is the vulva in the large majority of cases. As a rule there is no pain or inflammation at the site of infection.

## SIGNS.—

At the site of infection a small, round, copper-coloured raised papule appears, called a hard chancre. There is marked hardening of the tissues around it, or induration as it is termed, which feels, when palpated between the finger and thumb, like a small button inserted just below the surface of the skin.

This papule then breaks down into a small ulcer which has a greyish base and raised edges, so that it is funnel shaped. The discharge from the ulcer is thin unless it has been infected with septic microbes, when it is purulent.

The commonest sites for the appearance of the hard chancre are in the female the labia, then the cervix and the vagina ; nevertheless, a hard chancre may be found on any part of the body where there is a crack and the treponema has gained entrance. Thus it may be found on the lips and mouth of an innocent person who has been kissed by an infected person, or has used an infected glass, fork, spoon or pipe ; or upon the finger of a doctor or nurse who have not taken proper precautions when examining or nursing a patient suffering from this disease.

In eight or nine days the lymphatic glands which drain the site of the primary infection become enlarged and hard, but are painless and freely movable.

It must be remembered, however, that the primary sore in a woman often escapes detection, because it frequently disappears without its presence having been noticed, and when situated on the labia, vagina or cervix, even if it is detected, it more often than not fails to present the typical features of a hard chancre, the base not being indurated. Genital chancres are, as a rule, single, but labial chancres may be multiple, due to infection of the opposed surfaces.

#### DIAGNOSIS.—

If the secretion from a syphilitic lesion of the primary or secondary stages is examined under the microscope, by dark-ground illumination, *treponema pallida* can be detected. The diagnosis may also be determined by an examination of the blood-serum, a fortnight after the appearance of the chancre, the test being known as the Wassermann reaction. The Wassermann test is of great value as an aid to diagnosis in the case of women who have had many miscarriages, perhaps, therefore, due to syphilis, but who do not have any sign of syphilis.

### Secondary Syphilis.

#### SYMPTOMS AND SIGNS.—

The patient complains of loss of appetite, sore throat, pains in the bones and muscles, and a general feeling of weakness.

The following symptoms and signs may be, but all of them need not be, present. In fact the indications of this stage



may be so slight that they entirely escape notice. The first sign to appear is a rash which may be more of a red flush and lasts only a short time; its presence may pass unnoticed. At the onset there is fever. The patient is anæmic, her throat is red, and on her tonsils and mucous membrane of the mouth can be seen greyish-white patches, known as *mucous tubercles*. Similar patches, but rather more raised and moist, may be found in the region of the vulva and anus and are then known as *condylomata*, and of the secondary manifestations in women these are the most frequent and typical. It is very important to realize that these lesions are most infectious, and patients suffering from secondary syphilis are particularly liable to spread the disease by indirect contagion. The lymphatic glands in various parts of the body become enlarged, the hair falls out and the nails become brittle and may ulcerate. Rashes simulating every form and variety of skin disease may make their appearance. There is no itching with these rashes, which assume a raw ham-coloured hue. Inflammation of the iris, and of the bones and joints may also occur.

### Tertiary Syphilis.

This stage is predisposed to by overwork or alcoholic excess, and is much more likely to ensue when the treatment in the early stages has been neglected or insufficient.

#### SYMPTOMS AND SIGNS.—

The patient feels very ill, and further symptoms and signs will depend upon the part of the body affected.

Tumours, known as gummata, may appear in any part of the body and lead to the destruction of tissue in their neighbourhood.

Ulceration of the face may occur leading to a frightful disfigurement. The bones may be eaten away.

The heart and large blood-vessels may become attacked, and thousands of people who die of heart disease and aneurysm every year owe their death to being infected with syphilis years before.

The brain and spinal cord are particularly susceptible to the poison, for instance, locomotor ataxy. Blindness and epilepsy may be due to syphilis, and one of the most fatal

forms of insanity is due to this disease, namely, general paralysis of the insane. Thus 15 per cent. of all male admissions and 2·3 per cent. of all female admissions to lunatic asylums are due to this form of paralysis. If a patient becomes pregnant soon after acquiring syphilis she may miscarry, may go nearly to term when a macerated fœtus will be expelled, may give birth to a live child which soon dies, or the child, which at first appears healthy, may develop congenital syphilis later.

TREATMENT.—

Syphilis can be cured if promptly and systematically treated. The disappearance of the outward evidence of the disease after treatment has begun is not a guarantee that the disease is cured. *Neglect of treatment in these circumstances may be highly dangerous. Treatment should not be stopped until an expert says it is safe to do so.* It is only by following such advice that the terrible complications mentioned under tertiary syphilis can be avoided. Treatment must be commenced early and continued, perhaps, long after all outward signs of the disease have disappeared.

During treatment the teeth should be cleansed night and morning. Treatment may have to be stopped if the mouth is not kept clean. The patient should dress warmly, live simply, and avoid wine, beer and spirits.

If after treatment has been stopped, rashes on the skin, sore throat, or any other evidence of ill-health appears, a doctor should at once be consulted and informed of the previous treatment. *This is extremely important.*

A person who has had syphilis should not marry unless the Wassermann test is negative; otherwise the disease will probably be given to the wife or husband and any children they may have.

The treatment of syphilis in the primary and secondary stages consists in the injection into the blood, through a vein, of a solution of arsenic compounds, either salvarsan or N.A.B. which kills the spirochæte. In addition mercury in some form is given, the progress of the cure being determined and controlled by examination of small quantities of the blood-serum of the patient. The nurse must always remember the highly contagious nature of syphilis in its primary and

secondary stages. She must therefore, while she is attending a patient afflicted with this disease, wear an overall, and india-rubber gloves which should be boiled before and after use, otherwise if she has the slightest abrasion on her hands or fingers she may become infected. The spoons, forks, knives, glass, crockery, sponges, towels, bed-pans, and other articles used by the patient should all be kept for her separate use, and should never be removed from the room until they have been boiled, or soaked in a strong disinfectant, for such articles being contaminated may easily be the source of disease in others. For a similar reason such an infected patient should not be allowed to kiss any other person, or marry, until the disease has been cured. It has been stated that in more than half the cases syphilis has been contracted innocently.

The treatment should be carried out by an expert; that prescribed by chemists, herbalists and quacks is one of the most fertile causes of the terrible sequelæ of syphilitic infection.

## GONORRHŒA.

### CAUSE.—

Gonorrhœa is due to infection by the gonococcus, either directly by sexual connexion with an infected person, or indirectly by contact with infected towels, bedding, or other articles. The incubation period is usually from six to eight days.

### SYMPTOMS AND SIGNS.—

As a rule, the disease first affects the cervix, the glands of its mucous membrane facilitating the entry of the gonococcus; the vulva being infected secondarily. In adults the vagina generally escapes, its epithelium being too tough for the gonococcus to penetrate. In an acute case the external genital organs are inflamed, swollen and very tender, so that the patient is unable to walk or sit with any comfort. In addition she will complain of a profuse yellow discharge and of pain on micturition due to infection of the urethra.

The lymphatic glands in the groins, if the skin of the vulva is abraded, are infected by septic organisms and may suppurate.

Such acute cases are not common, and, more especially if



the cervix alone is involved, the only indication may be a slight discharge.

DIAGNOSIS.—

The disease is diagnosed for certain by the detection of the gonococcus in the discharge. Unless, however, the discharge is examined in an early stage of the disease, the presence of this organism may escape detection. The reason for this is that the gonococcus finds it very difficult to remain for any length of time in the vulval or vaginal tissues owing to the toughness of the epithelium covering these structures, and the organisms are therefore soon swept away by the inflammatory discharges and the vaginal douches which have most likely been employed before the patient sought advice. The organisms, however, may remain in the cervical or urethral glands, or in those of Bartholin's gland for a long time, without there being any indication of their presence, in other words the woman is a "carrier."

Apart from the detection of the gonococcus there are a few points, however, in the history, symptoms, and signs of this disease which are extremely suggestive:—

Thus if the discharge appears suddenly and is profuse, if the inflammation is very acute, if there is pain on micturition, and if the lymphatic glands in the groins are swollen and tender, the infection will almost certainly be of gonorrhœal origin.

RESULT.—

Unless gonorrhœa is treated in its early stage and efficiently, it becomes chronic. A large number of patients, especially those of the female sex, being unaware of their infection, do not seek medical advice till the disease has been present for some time and has had an opportunity to spread. In this way the disease may spread from the vulva or cervix to Bartholin's gland, causing an abscess therein, to the body of the uterus, Fallopian tubes, ovaries, and pelvic peritoneum, and rarely to the general peritoneum, or it may spread *via* the urethra to the bladder, ureters, and kidneys.

The blood may become infected with the gonococcus, in which case puerperal fever, gonorrhœal rheumatism, septicæmia, or ulcerative endocarditis may result. If the organism infects the mucous membrane of the eyelids, gonorrhœal ophthalmia supervenes, which may easily destroy the eyesight.

Gonorrhœa is one of the most serious diseases a woman can acquire, since spreading, as it may do, to the Fallopian tubes, ovaries, and pelvic peritoneum, it binds them together, forming one mass to which the term salpingo-oophoritis is applied. This complication is a cause of great misery and of more or less disablement, besides being responsible for a large percentage of the major operations of a gynæcological nature performed on females. Gonorrhœa, in fact, is a much more serious disease than is usually thought, and is harder to cure than syphilis. It is responsible for a large proportion of the total number of cases of sterility in women and of two-thirds of the cases of blindness from birth.

TREATMENT.—

Gonorrhœa can be cured by early and skilled treatment. Rest in bed is absolutely necessary, and in the majority of acute cases the patient will be ordered to sit in a hot bath, three or four times a day, for twenty minutes, between which hot fomentations of lead will be applied to the vulva. If the vulva is alone infected, douches should not be given, because of the danger of carrying the disease upwards. If, however, the cervix or vagina are infected, hot douches containing some mild antiseptic will be prescribed.

As the danger of the disease spreading is so great, especially in women who have borne children, in whom the cervical canal is more or less open, and as its results may be so disastrous, the best treatment, after the acute stage has subsided, is to paint the vagina with one of the many preparations of silver, such as silver nitrate, protargol or argyrol, all vaginal discharge being first thoroughly removed by cotton-wool swabs. After the silver preparation has been applied a cotton-wool tampon soaked in one of these remedies is introduced into the vagina and left there for eight hours. In some cases, because of the tenderness, an anæsthetic has to be used for the first treatment. If there is any evidence that the urethra is involved similar application may be made to this canal by means of a Playfair's probe and also, if need be, to the cervical canal.

In many cases the skin round the vulva becomes sore from the irritation of the discharge, when an application of zinc ointment and castor oil to the surfaces involved will afford relief.

The nurse must be most careful to use every precaution when nursing a case of gonorrhœa, lest she convey the disease to herself, or some other person. Extreme cleanliness is necessary ; thus she should wear an overall and india-rubber gloves, all dressings which have been in contact with the discharge should be burnt, soiled linen should be soaked in carbolic solution 1 in 20, and bed-pans and the douche apparatus should be thoroughly cleansed and sterilized after use. Many epidemics of gonorrhœa have arisen in families through children using the same towels as their infected mother, and in institutions through the use of towels or utensils which have been contaminated in the first place by some adult.

So long as the patient harbours the microbe she is liable to convey the disease to others. Since the gonococcus may rest in the cervical glands for a long time, without causing any symptom but a discharge, a nurse should advise the patient to have a swab-specimen taken from the cervical canal, on one or two occasions, after a cure has been presumed.

During treatment condiments must be avoided and large quantities of barley water should be drunk. Indulgence in alcoholic drinks seriously interferes with the efficiency of treatment, and often brings back the discharge after an apparent recovery.

**Gonorrhœal Warts of the Vulva.**—These warts, caused in chronic cases by the long-continued irritation of the discharge, may become infected, when ulceration results, the discharge being horribly offensive. They will disappear if the discharge causing them is cured, and their surface is kept dry with a dusting powder containing calomel and zinc oxide.

## SOFT SORE.

### CAUSE.—

The soft sore results from infection by Ducrey's bacillus. It is purely a local affection and remains so. The condition is very contagious.

### SYMPTOMS AND SIGNS.—

Within five days of infection the patient will complain of pain, heat in, and a profuse discharge from the vulva.

The local condition commences with a series of pustules



which soon break down into small ulcers. The ulcers are round, sharply cut and their base is covered by a grey-yellowish slough. The ulcers secrete a purulent discharge. The lymphatic glands in the groin become enlarged, inflamed, and painful. More than one soft sore may be present, opposite sides of the vulva being commonly affected.

#### TREATMENT.—

Soft chancres are easily cured by strict cleanliness and by the application of antiseptic lotions, after which an antiseptic dusting powder is applied to keep the affected parts dry. The patient should be kept in bed.

The nurse, when attending patients the subjects of soft sore, must take precautions similar to those advised under the sections dealing with syphilis and gonorrhœa, lest she herself becomes inoculated.

### The Nursing of Venereal Diseases.

When nursing patients suffering from gonorrhœa, soft sore, or syphilis, the nurse should realize that infection is liable only by actual contact with the sore or discharge. The routine methods of disinfection and precaution practised when nursing septic patients will therefore, if conscientiously carried out, protect the nurse from any risk of infection. Moreover, when attending a patient known to be suffering from one or other of these diseases, the nurse will have the added safeguard of being aware of the danger, instead of dealing with it, all unrecognized, as happens, in the many obscure ways, in the general wards.

The nurse should bring to her work a large amount of sympathy, which she should seek to make practical by a wider understanding of the social conditions that are to a great measure accountable for this social evil.

Many women are innocent victims and call for the tenderest pity; others fall victims through the temptations and dangers to which unprotected girls are exposed, the lack of home discipline, their ignorance of ethics, the greyness and hardships of their struggling lives.

The nurse will thus treat those unfortunate sufferers who are under her care with a wise compassion that will ensure

ready and sympathetic help when required, and should exert a quiet influence that will strengthen their moral nature and restore their self-respect.

With practical common sense, the nurse may lead women suffering from these diseases to realize the danger to the community of their condition, and the terrible consequences thereof to innocent lives. A nurse has here a great mission and a real duty to her sex, her country, and the world at large.

The nurse must never express the opinion or even hint that her patient has venereal disease. By so doing she may expose herself to legal action.

## CHAPTER XXI.

### INFECTION OF THE FEMALE URINARY TRACT.

#### CYSTITIS.

INFLAMMATION of the bladder has a distinct interest for nurses, since by carelessness they may be the cause of it.

##### Acute Cystitis.—

##### CAUSE.—

Cystitis is due to bacteria infecting the mucous membrane of the bladder. The infection, as a rule, ascends through the urethral canal or is carried into the bladder by a catheter which has been used without proper precautions, or when purulent urethritis is present. The organisms most usually present are the bacillus coli, streptococci, staphylococci and gonococci. In other cases the infection may descend to the bladder from the kidneys in which case the organisms are the bacillus tuberculosis or bacillus coli.

*The nurse must never forget the great danger, to the patient, of passing a catheter which has not been rendered aseptic by boiling.*

##### SYMPTOMS AND SIGNS.—

The patient complains of pain in the perineum and over the pubes. The bladder is very irritable owing to its inflamed mucous membrane. Directly, therefore, urine commences to stretch the bladder, pain results and there is an urgent desire to empty the bladder. The contraction of the bladder necessary to empty it brings about further pain. The patient thus suffers from great frequency of micturition, passing very little urine at a time, accompanied by very severe spasmodic pain. The symptoms of fever are present, more or less severe, and a rigor may occur at the commencement.



The urine is acid, except in those cases in which the urea is split up with the formation of ammonia. It is turbid, contains mucus, pus, and perhaps blood.

#### TREATMENT.—

The patient must be kept in bed, hot fomentations may be applied to the lower abdomen, and she must be encouraged to drink large quantities of barley water. Among other measures prescribed may be that of washing out the bladder (see p. 274) when the acute stage has passed off. The doctor will order urinary antiseptics.

### Chronic Cystitis.—

#### CAUSE.—

Chronic cystitis is more common; it may be a sequel of the acute variety, and is also due to retention of urine due to pressure of a fibroid or ovarian cyst.

Bacteria being conveyed to the retained urine decompose it, and the ammoniacal urine so lowers the resistance of the mucous membrane that the bacteria are able to inflame it.

#### SYMPTOMS AND SIGNS.—

The patient has a constant desire to pass water, and does so several times during the day and night. As a rule pain of any severity is absent.

The urine is alkaline, extremely offensive, resembling the odour of decomposing fish, and contains a variable amount of mucus and pus which settles as a deposit on standing.

There is a variety of cystitis due to infection with the bacillus coli, which at times supervenes after an abdominal section. In these cases the urine is acid and there is often a trace of pus present.

#### TREATMENT.—

The doctor will order urinary antiseptics and bladder irrigation, and if the cause can be detected he will treat that.

### Results of Cystitis.—

Cystitis is a dangerous condition because of the possibility of the infection spreading up to the kidney by way of the ureters, giving rise to pyelitis (inflammation of the pelvis of

the kidney) or nephritis (inflammation of the kidney substance), which may have a fatal termination.

### PYELITIS.

In this condition the pelvis of the kidney is infected by bacteria gaining access to it from the blood-stream, the bowel, or *via* the urethra and ureters. Pyelitis occasionally supervenes after an abdominal section, the organism in such cases being the bacillus coli. Pyelitis may be acute or chronic.

#### SYMPTOMS AND SIGNS.—

In the acute variety the patient is seized with very severe abdominal pain. The temperature is high, irregular, and there may be repeated rigors. The pulse-rate rises to 120 or so, vomiting may be severe, and there is pain in the renal region and great tenderness when the kidney is palpated. The urine is acid, and contains pus and a large quantity of bacilli. The condition has often been mistaken for acute appendicitis, chole-cystitis and puerperal sepsis.

In the chronic form the symptoms are not so severe and are principally those of ill-health and backache.

#### TREATMENT.—

Large quantities of fluid to dilute the urine will be ordered. Since the bacillus coli does not flourish in an alkaline urine, the doctor will prescribe potassium citrate till the urine is very alkaline, after which he will probably prescribe hexamine and acid sodium phosphate, the former drug setting free formalin in the presence of the sodium phosphate and, therefore, acting as a urinary antiseptic.

## PART XIII.

### CHAPTER XXII.

#### TUMOURS AND NEW GROWTHS.

TUMOURS of the genital organs may be cystic or solid, and these in their turn are innocent or malignant. The seat of cystic tumours is most commonly the ovaries, while that of tumours which are solid is generally in the uterus.

**Cystic Tumours.**—Cystic tumours are found—

In the vulva as Bartholin's cysts.

In the vagina as vaginal cysts.

In the ovaries as ovarian cysts.

In the uterus as fibroids which have undergone cystic degeneration.

In the Fallopian tubes as a hydro-salpinx, pyo-salpinx, or hæmato-salpinx.

Cysts of the ovary are either innocent or malignant. The remaining cysts mentioned are innocent in nature.

**Solid Tumours.**—A solid tumour may be found in any of the genital organs, when it is known as a fibroma, endometrioma, carcinoma, or sarcoma.

A fibroma, or fibroid, is composed of fibrous tissue with a small amount of muscle.

An endometrioma of the uterus is composed of muscle, fibrous tissue, and endometrial glands between the muscle fibres.

A carcinoma is a malignant tumour, and when composed of squamous epithelial cells it is known as a squamous-celled carcinoma, and when of columnar epithelial cells it is called a columnar-celled carcinoma (glandular-carcinoma or adenocarcinoma).



A sarcoma is a malignant tumour composed of cells of connective tissue.

In addition the uterus may be the seat of tumours called polypi, which may be composed of fibrous tissue and muscle, the fibroid polypus ; of glandular tissue, the mucous polypus, or of placental tissue, the placental polypus.

## VULVA.

The commonest tumours of the vulva are a Bartholin's cyst, urethral caruncle, and carcinoma, and these only will be dealt with.

### Bartholin's Cyst.

The commonest cyst of the vulva is known as Bartholin's cyst, from the name of the anatomist who first described the gland that is affected. It usually appears on one side only.

CAUSE.—

The duct leading from Bartholin's gland becomes obstructed as the result of inflammation, and the mucous secretion being unable to escape, accumulates in the gland, and converts it into a cyst.

SYMPTOMS AND SIGNS.—

Discomfort in sitting or walking, and pain if the cyst suppurates, which may result from injury or gonorrhœal infection. The swelling is rounded and is situated in the inner surface of the posterior part of the affected labium majus. It may attain the size of an unshelled walnut.

TREATMENT.—

The whole of the cyst wall must be dissected out, otherwise if it is only incised the condition may recur. If an abscess forms the cyst must be opened, the interior swabbed with strong antiseptics and hot fomentations applied.

### Urethral Caruncle.

A urethral caruncle is a small growth on the posterior wall of the urethra, just near its orifice. It is composed of connective tissue and dilated blood-vessels, covered by epithelium.

## CAUSE.—

The cause is not known, but the evidence is in favour of its being due to infection of a small gland at the entrance of the urethra known as Skene's tubules. It occurs most commonly in middle-aged married women.

## SYMPTOMS AND SIGNS.—

The patient may not know of its existence or she may complain of pain on micturition, or when the caruncle is touched.

Projecting from the orifice of the urethra will be seen a bright red growth generally about the size of a split-pea, and resembling a miniature cockscomb. Caruncles vary in their sensitiveness, some are exquisitely tender, others can be touched without the patient feeling any pain. A few bleed on being touched.

## TREATMENT.—

The urethral caruncle is removed by excision and cauterization of its base since, unless it is entirely removed, it is apt to return.

### Leukoplakia Vulvæ.

Leukoplakia vulvæ, being a chronic inflammatory condition of the vulva and adjacent skin, should be included under the section dealing with infection. As, however, this disease is followed by cancer of the vulva, unless cured, it is dealt with here.

## CAUSE.—

The cause is not known. It occurs most frequently in married women at or about the menopause.

## SYMPTOMS AND SIGNS.—

The most marked symptom of leukoplakia is itching of the vulva which may be very intense and persistent. The patient will complain of local pain and tenderness if ulcers or fissures are present.

When well developed, leukoplakia can be diagnosed without much difficulty by a nurse. The whole of the vulva, except the vestibule, may be attacked. The inner surfaces of the labia majora are smooth as if ironed out, and have the appearance of being covered by a thin layer of milk. The

colour is parchment-like. In addition, when the disease is more advanced, fissures or small ulcers may develop.

#### TREATMENT.—

The nurse should counsel the patient to seek medical advice at once, because if the disease is efficiently treated malignant disease of the vulva will be avoided.

For slight cases, the treatment will consist in the application of various lotions and ointments. If one fails another may succeed. The application of X-rays will at times lead to a cure.

When, in spite of such treatment, the disease is persistent, and especially if ulcers or fissures are present, the affected area should be excised so as to prevent cancer supervening. In fact, many authorities maintain that leukoplakia should always, in the first instance, be treated by excision.

### Cancer of the Vulva.

As a rule cancer of the vulva first appears when the woman is between fifty and sixty years of age.

#### SYMPTOMS AND SIGNS.—

The first symptom noticed is pruritus. Later when the growth ulcerates there will be pain, bleeding, and an offensive discharge. Towards the termination of the disease additional symptoms may be due to the escape of urine and fæces from the formation of fistulæ from ulceration into the bladder and rectum, or there may be retention of urine due to the growth obstructing the urethra. What with the loss of sleep from the pain, anæmia from the bleeding, septic absorption from the ulceration, and inability to take food, patients in the last stages of this disease are the subjects of abject misery.

The disease first commences as a small hard nodule, most commonly on a labium majus, more rarely on the clitoris. Prior to the appearance of this nodule the vulva has in nearly all cases, if not all, been affected with leukoplakia. It is but rarely that patients consult a doctor when the disease is in such an early stage. As a rule, the patient first seeks advice because of an ulcer, the edges of which are raised and turned outwards. The glands of the groin become enlarged and hard from lymphatic spread of the growth.



In the last stages the ulceration spreads over the vulva on to the groins, abdomen, and thighs.

TREATMENT.—

The nurse should advise a patient to consult a medical practitioner at the earliest moment if her advice is sought, since it is probable that the most likely treatment to cure the disease is a wide and early removal of the growth and inguinal glands. Treatment by X-rays and radium will ameliorate the disease and, perhaps, in some cases, may cure it.

Unfortunately from ignorance of the presence of the growth, carelessness, or disinclination of the woman to seek advice, carcinoma of the vulva does not come under the care of the gynaecologist in its early stages. The nurse should always advise a patient suffering from leukoplakia, which is not difficult to diagnose, to seek medical advice.

There are other swellings of the vulva, some of which are not uncommonly found. Although not tumours in the generally accepted sense of the term, they will be described under this section as they form swellings.

### Hæmatoma of the Vulva.

CAUSE.—

A hæmatoma of the vulva is caused by an extravasation of blood due to the rupture of some vessel by a kick or fall, or by the pressure of the fœtal head during delivery.

SYMPTOMS AND SIGNS.—

There will be a history of injury.

The swelling is tender and discoloured and may be in any part of the vulva. Rarely it suppurates.

During labour the formation of a hæmatoma of the vulva may cause a serious obstruction to the birth of the child.

TREATMENT.—

The doctor will order cold lead compresses to be applied to the swelling, and on occasions will incise it and evacuate the blood-clot.

### Inguinal Hernia.

SIGNS.—

This is characterized by a swelling which appears at the anterior end of the labium majus.

It disappears when the patient lies down.

There is probably an impulse on coughing.

The swelling, as a rule, can be pushed back into the abdominal cavity and kept there by a truss. Occasionally the bowel gets nipped and gives rise to symptoms of strangulation, which if not relieved will kill the patient.

TREATMENT.—

The condition should be cured by operation unless the patient is not fit for such treatment, when a truss will have to be worn.

### Varicose Veins of the Vulva.

CAUSE.—

Pressure of the pregnant uterus, or of an abdominal tumour, on the veins of the pelvis.

SYMPTOMS AND SIGNS.—

This condition is easily identified and, as a rule, it does not cause much trouble, except an aching and occasionally pruritus.

Varicose veins, however, may be a source of great danger if they burst, since the woman may bleed to death before help can be obtained.

During pregnancy the veins may become very enlarged forming cords the size of the little finger, stretching up on to the abdomen and down on to the thighs, and in some cases obscuring the vulva.

TREATMENT.—

Labour may have to be terminated prematurely, lest the veins should cause an obstruction during labour, or burst. In the non-pregnant woman the varicose veins must be excised if they cause trouble.

## CHAPTER XXIII.

### UTERUS.

THE commonest tumours of the uterus are a fibroid, an endometrioma, a polypus, and cancer.

#### Fibroid Tumours.

Exactly how often the uterus of a woman is the seat of a fibroid tumour it is difficult to say. Authorities vary in their estimates, but the statistics of the dead-house show that 40 per cent. of women over fifty years of age have fibroid tumours.

These statistics, however, include fibroids, not larger than a pea, which never cause their owner any trouble, and which are only found on the routine inspection of the operating or post-mortem room.

Fortunately in the large majority of women, whose uteri are thus affected, the tumour is small, symptoms are absent, and its presence remains undetected.

On the other hand, both by growth and by changes taking place in them, fibroids may be directly responsible for the termination of life. The majority of fibroids giving rise to symptoms first cause trouble between the ages of thirty and forty-five. Fibroids are more often multiple than single.

According to their position fibroids are classified as : pedunculated-subperitoneal, subperitoneal, interstitial, submucous, and pedunculated-submucous (fibroid polypus).

By a pedunculated-subperitoneal fibroid is meant a fibroid which is projecting into the abdominal cavity, and is attached to the external surface of the uterus by a stalk.

A subperitoneal fibroid is a fibroid projecting from the external surface of the uterus just under the peritoneum, so that the outer surface of the uterus is uneven.



An interstitial fibroid is one growing in the wall of the uterus, and not projecting beyond either its external or internal surface.

A submucous fibroid projects towards the cavity of the



FIG. 26.—A uterus, the seat of multiple fibroids, cut in half to show the directions in which a fibroid may grow, starting as an interstitial fibroid. 1. Pedunculated-subperitoneal; 2. Subperitoneal; 3. Submucous; 4. Interstitial; 5. Fibroid polypus of body; 6. Fibroid polypus of neck of uterus; 7. Vagina.

uterus pushing the mucous membrane before it, and causing the internal surface to be irregular.

A pedunculated submucous fibroid—or, as it is generally termed, a fibroid polypus—is in reality a later stage of a submucous fibroid. The tumour covered with mucous membrane is expelled from the uterine wall into the cavity of the uterus, all except a small portion which forms a stalk.

## SYMPTOMS.—

Menorrhagia ; metrorrhagia ; leucorrhœa ; dysmenorrhœa ; sterility, and those of pressure.

**Menorrhagia, Metrorrhagia.**—The amount of hæmorrhage caused by fibroids varies greatly in different women.

The loss in some women is only a slight increase at the periods, in others the menorrhagia and metrorrhagia are so marked that the term “flooding” is very commonly given to the great hæmorrhage, which may be directly the cause of death. It is only very rarely, however, that a woman dies from hæmorrhage due to these tumours, and then only, as a rule, because the loss has been spread over a long period, and the patient has been allowed to become exsanguinated by inefficient or no treatment.

The different kinds of fibroids vary in the amount of bleeding they are likely to cause, thus, the pedunculated-subperitoneal and subperitoneal varieties alone do not give rise to any bleeding. A fibroid polypus, as a rule, causes more hæmorrhage than any other variety. The interstitial and submucous fibroids often cause serious bleeding.

If a fibroid becomes septic, cystic, or malignant, or undergoes red degeneration, the amount of blood lost will be increased.

**Leucorrhœa.**—This may be due to several causes. Since in all varieties except the pedunculated-subperitoneal and subperitoneal the amount of mucous membrane lining the enlarged cavity of the uterus is greater, the number of glands in the membrane is considerably increased, with the result, therefore, that there is much more secretion. The leucorrhœa may be due to congestion, to endometritis, or it may be due to a sloughing fibroid polypus, when the discharge will be horribly offensive, and the condition may be mistaken for one of cancer.

**Dysmenorrhœa.**—The pain at the periods associated with fibroids may rarely be due to the fibroid obstructing the escape of blood from the uterus (colicky dysmenorrhœa), but most commonly it is due to congestion (congestive dysmenorrhœa). As a rule fibroids first give rise to symptoms between the ages of thirty to forty, and so if the patient first complains of the dysmenorrhœa at this time the nurse should suspect the

presence of a fibroid and advise the patient to consult a doctor.

**Sterility.**—Fibroids large enough to be detected on examination, and which give rise to symptoms, are a hindrance to impregnation, but the combination of fibroids and pregnancy is not an uncommon one. Moreover, fibroids first appear, as a rule, after the most fruitful time for childbearing. Fibroids develop in married women more frequently than in those unmarried.

### **Pressure Symptoms.**—

*Pressure on the Bladder and Urethra.*—Pressure on the bladder will cause frequency of micturition, and on the neck of the bladder and urethra retention. A very significant symptom of the presence of a dangerous variety of fibroid in the uterus is retention of urine for a few hours, or a day, before the period ensues. A history such as this makes it practically certain that a fibroid is filling the pelvis all but a very little, and will soon be exerting very injurious pressure on the surrounding structures. The extra amount of blood that flows to the uterus and tumour, a few days before the period is due, causes the tumour to swell sufficiently to occlude the urethra and so retention results. The most likely fibroid to cause this complication is a cervical fibroid since it cannot rise out of the pelvis.

*Pressure on the Ureters.*—A fibroid which is lodged tightly in the pelvis—impacted, as it is termed—will press on the ureters, as may also a very large fibroid reaching up into the abdomen. The kidney may then become diseased by the backward pressure of the urine which has difficulty in getting into the bladder, and the patient may eventually die of uræmia, if the tumour is not removed.

*Pressure on the Bowel.*—The large intestine may be nipped against the brim of the pelvis by a heavy tumour. The small intestine may become twisted round the stalk of a pedunculated-subperitoneal tumour, and the rectum may be obstructed by an impacted fibroid. In the latter case constipation results, and, in all three, intestinal obstruction or ulceration and perforation of the intestine, with fatal peritonitis, may occur.



*Pressure on the Veins.*—As a result the patient may suffer from hæmorrhoids, œdema of the legs, varicose veins of the leg or vulva, or thrombosis in the femoral veins.

*Pressure on the Nerves.*—This may give rise to neuralgia, bearing-down pain, backache, or sciatica.

*Pressure on the Diaphragm and Stomach.*—With very large tumours—and tumours over 100 pounds in weight have been recorded—the action of the diaphragm is impeded so that the heart and lungs cannot properly perform their respective functions. Indigestion may result from pressure on the stomach.

### **Secondary Changes in Fibroids.**—

A fibroid tumour may become septic, cystic, malignant, undergo red degeneration or it may atrophy.

**Septic Fibroid.**—A septic fibroid is a very dangerous tumour. The patient is likely to die of peritonitis if the sepsis spreads to the peritoneal cavity, or she may die of septicæmia. A fibroid may become infected from disease of the bowel, of the appendix, or of the Fallopian tubes. It may become septic from pressure during labour, or it may be infected in a case of puerperal sepsis after labour. Lastly, a fibroid polypus becomes septic by microbes from the vagina infecting it.

Submucous fibroids and fibroid polypi at times escaping treatment are infected, suppurate and then discharged so that a cure results, but the patient may become so dangerously ill during the process that she will die before the tumour can be expelled.

#### **SYMPTOMS.**—

The patient will have a high temperature, a rapid pulse-rate, perhaps a very fœtid discharge; the amount of bleeding will increase, the fibroid will be tender, and there will be marked abdominal pain.

**Cystic Fibroid.**—In this complication the solid tumour becomes converted into a cyst, and has thus often been mistaken for pregnancy or an ovarian tumour.

#### **SYMPTOMS.**—

The size of the tumour increases rapidly, and it becomes softer. There is severe pain, and the amount of blood lost

is increased. Ovarian cysts, as a rule, and pregnancy are associated with amenorrhœa.

**Malignant Fibroid.**—A fibroid may become involved through the spreading of a cancer of the uterus. Very rarely a fibroid may become sarcomatous.

SYMPTOMS.—

Such a complication would be indicated by very rapid growth, marked bleeding, severe pain and emaciation.

**Red Degeneration.**—In this the fibroid becomes dark red in colour and increases in size. It is a condition nearly always associated with pregnancy, and may cause trouble then, or after labour.

SYMPTOMS.—

The patient complains of pain, tenderness, and of the symptoms of fever which is present.

**Atrophy.**—A fibroid never appears after the menopause, and at this time if one is present in the uterus it will atrophy. Such atrophy, except the tumour be smaller than an orange, never goes on to complete disappearance. It is for this reason that a woman nearing the menopause should never be advised to keep her tumour, if it is causing trouble, on the assumption that it will soon disappear. On the contrary, a fibroid is often the cause of trouble at the time of the menopause since it may prolong menstrual life with, perhaps, excessive hæmorrhage, or may become polypoid and septic, as the result of the shrinking uterus forcing the tumour into its cavity and cutting off its blood supply. Lastly, the atrophy may be the direct cause of serious trouble, or even death, in the case of a fibroid which was resting above the brim of the pelvis, but which, on its reduction in size, sinks down and becomes impacted in the pelvis.

#### METHODS BY WHICH FIBROIDS ENDANGER LIFE.

By hæmorrhage, by sepsis, by pressure, by becoming malignant, by twisting of the pedicle, and by complicating pregnancy, labour, or the puerperium.

The dangers of some of these complications have already been discussed.

**Twisting of the Pedicle.**—The stalk of a pedunculated-

subperitoneal fibroid may become twisted in the same manner as that of an ovarian cyst. Pain results, and the tumour may become inflamed and be the cause of internal hæmorrhage through the bursting of veins on its surface.

**Effect of Fibroids on Pregnancy.**—The pressure symptoms of pregnancy may be more marked, vomiting more troublesome, and in some cases the tumour may possibly favour the occurrence of albuminuria. Pregnant women with fibroids may miscarry from uterine contractions or bleeding set up by the tumours, or because the uterus has become retroverted, and in some cases also impacted. Accidental hæmorrhage is at times due to a fibroid.

**Effect of Pregnancy on the Fibroid.**—The fibroid grows more rapidly, and in some cases the dangerous change known as red degeneration may appear.

**Effect of Fibroids on Labour.**—A fibroid may cause obstruction to labour and so, if unrelieved, rupture of the uterus, by being situated below the presenting part and narrowing the passage, or by causing malpresentation of the child. A fibroid may also cause inertia of the uterus and post-partum hæmorrhage either as a result of this inertia, or because it prevents the proper retraction of the uterus.

**Effect of Labour on Fibroids.**—The fibroid may be so bruised, owing to the passage of the child, that later it becomes infected. Also the stalk of a pedunculated-subperitoneal fibroid may become twisted.

**Effect of Fibroids on the Puerperium.**—Fibroids are a cause of subinvolution. They may also give rise to secondary post-partum hæmorrhage and, if they become septic, they may cause septicæmia.

**Effect of the Puerperium on Fibroids.**—A submucous fibroid may, as the uterus shrinks, become converted into a fibroid polypus, and if septic may then become expelled. A fibroid may also undergo red degeneration at this time, and have to be removed. A fibroid may become infected as a result of sepsis due to the introduction of germs during labour.

Although the above is a serious list of complications which may ensue should a woman with a fibroid conceive, yet, as a matter of experience, it is found that in a very large majority



of patients the pregnancy, labour, or the puerperium is normal and, therefore, unless some complication does arise, operative treatment is not necessary.

It is far different, however, in the case of an ovarian cyst, complicating pregnancy, labour, and the puerperium. In this case there is a very real danger, so much so that the tumour should be removed as soon as possible.

#### TREATMENT.—

Fibroids need treatment either because they are causing serious hæmorrhage, because they are endangering life by pressure, because some complication arises in them or more rarely because of their size.

#### Hæmorrhage.—

We may divide cases of hæmorrhage due to fibroids into three classes :—

1. In which the hæmorrhage is so bad that a surgical operation, most frequently hysterectomy, is required to save life. Rare.

2. In which the hæmorrhage is severe, but not so severe as to threaten life. The tumour should be removed by myomectomy or hysterectomy, or removal of the polypus, as the case may be. Fairly common.

3. In which the hæmorrhage is comparatively slight, and can be controlled by drugs if the patient so decides. Common.

In those cases in which bleeding due to fibroids starts within a year or two of the menopause, and the patient is averse to operation, so long as the bleeding is not imperilling life, drug treatment may be tried. It must always be remembered, however, that the menopause in such cases is apt to be postponed for some time, and also that *increased bleeding in a woman with fibroids near the menopause may be due to cancer arising in the uterus, or to some change in the fibroid.*

Poor patients, who have to earn their own living, should be strongly advised to submit themselves to operation, since if they have to stay away from work four or five days in each month their employer will probably dismiss them.

In the majority of cases the correct treatment for hæmorrhage due to fibroids, sufficient to make a woman a semi-invalid, is to remove the tumour or tumours.

The mortality of the operation is so low, and the improvement in health, as a result of the operation, is so striking that, with this knowledge, it is now an everyday experience for women suffering from hæmorrhage due to fibroids to consult medical men, with a view to having them removed.

### **Pressure.—**

If a fibroid is endangering life by pressure it must be removed; but a difference of opinion arises when life is not endangered, and the difficulty is to decide whether a fibroid which is not bleeding, but is of a fair size, should be removed. Many surgeons think that such a fibroid should be removed because it is a mistaken policy to wait until pressure symptoms have developed, since then the patient will not be so well able to withstand the operation, which itself will be much more difficult and severe than if the fibroid had been removed at an earlier date.

If, on repeated examination, a fibroid, although not causing hæmorrhage, is found to be steadily increasing in size, then it will be in the best interests of the patient to remove it before pressure symptoms have developed.

### **Degeneration.—**

If a fibroid becomes septic, cystic, or is undergoing red degeneration, it must be removed forthwith. These complications are rare. If a patient is under medical observation the onset of such degenerations will be detected.

### **TREATMENT.—**

The mortality of hysterectomy, or myomectomy, for fibroids is, with skilled operators, less than 5 per cent. If the results of all operators were collated, the mortality would be found to be considerably higher. But even supposing that the death-rate from such operations, by operators skilled in this special branch of surgery, was no greater, or even a shade less, than if these cases were left alone, this would be no good reason for the dictum that all fibroids unassociated with hæmorrhage should be removed as a precaution against the chance of the tumour becoming the seat of some secondary change since, if such treatment became recognized and was carried out by doctors not having special experience in this class of work,

the operative mortality would at once very seriously increase, and be out of all proportion to the risk incurred by leaving the tumour.

If a fibroid tumour is by its size causing distress it should be removed. In the case of an unmarried woman a fibroid from its size may lead to a suspicion of pregnancy, in which case she would be justified in demanding its removal, even though it was not causing any discomfort.

There are three operations for fibroid tumours of the uterus :—

(1) Total hysterectomy, (2) Sub-total hysterectomy, (3) Myomectomy.

Whether total or sub-total hysterectomy is performed will, in most cases, depend upon the predilection of the operator. Some gynæcologists prefer to remove the whole uterus, maintaining that it is then impossible for the patient to have cancer of the cervix. It is true that cancer does rarely occur in the cervix after a sub-total hysterectomy, its incidence in such cases is, however, much rarer than cancer of the cervix generally. It is acknowledged that a total hysterectomy is a more serious and dangerous operation than the sub-total variety and, for this reason, the advocates for sub-total hysterectomy are in the majority.

Myomectomy, or removing the tumour or tumours and leaving the uterus, is the ideal operation in certain circumstances, when, for instance, the patient is single, when, if married, she is sterile and wants a child, and in any case when the patient is under forty years of age and the danger of the operation is not increased materially. In experienced hands myomectomy is probably not more dangerous than hysterectomy, but if practised by all and sundry then the results would show that it was a far more dangerous operation. The chief disadvantage to myomectomy is that other fibroid tumours may grow in the uterus, necessitating a hysterectomy later.

### Polypi of the Uterus.

The following varieties of polypi may be found in the uterus :—

Fibroid. Mucous. Placental.



**Fibroid Polypus.—**

This condition has been dealt with under fibroids of the uterus.

**Mucous Polypus.—**

At times the amount and thickness of the endometrium becomes much increased, and moreover, this increase may be more marked at certain spots than others, with the result that a small projection of mucous membrane is formed, which is called a mucous polypus. There may be one or more of these projections, which may grow from the body or the neck of the uterus. In some cases mucous polypi are the result of infection of the endometrium, but in others no evidence of this can be found.

**Placental Polypus.—**

If a piece of placenta remains in the uterus after the birth of the child and the expulsion of the membranes and the main portion of the placenta, the subsequent events depend greatly upon whether the portion of placenta retained dies or not.

If it dies, microbes infect it, and septic intoxication results. On the other hand, if it is adherent to the uterine wall, and well nourished by blood-vessels, it need not die. Then as the blood trickles over this piece of placenta fibrin becomes deposited on it and a small polypus is formed.

**SYMPTOMS OF POLYPI.—**

Menorrhagia ; metrorrhagia ; vaginal discharge, which in some cases is very offensive ; dysmenorrhœa.

If a placental polypus is present the symptoms will date from labour or abortion.

**TREATMENT.—**

Removal of the polypus.

**Endometrioma.**

Until the uterus is removed and the tumour is incised an endometrioma will not be diagnosed. Such a tumour is generally removed on the supposition that it is a fibroid tumour, or for a condition known as chronic metritis. The

symptoms correspond to those of a fibroid, the most striking of these being an excessive loss at the periods and severe dysmenorrhœa. The uterus will be enlarged but not irregular as in most cases of fibroids. An interesting point concerning endometriomata is that they are found in many other situations beside the uterus ; for instance, in the ovary, Fallopian tube, pelvic peritoneum, recto-vaginal septum, umbilicus and abdominal wall.

In the three former it is supposed that shreds of endometrium pass along the Fallopian tubes to the peritoneal cavity and become attached on the way. In the two latter the shred of endometrium is implanted in the abdominal wound during a hysterectomy or myomectomy.

### Cancer of the Uterus.

Approximately one in every eleven men and one in every eight women, over the age of thirty-five, die of cancer during the year in England and Wales. In 40 per cent. of the deaths from cancer in women the uterus is affected. More women die of cancer than of consumption. From 1911-1920 for every 100 deaths from cancer of the uterus in single women there were as many as 1009 among the married women. As during this period there were 463 deaths of married and widowed for every 100 deaths of single women, in the case of cancer of the uterus, the excess of deaths in the married as against that in the unmarried is much larger than normal.

The disease may first appear in the body of the uterus or in the neck. Cancer of the body is fairly rare ; most patients suffering from it are between fifty and sixty years of age, and many of them have not had any children.

Cancer of the neck is, in comparison with cancer of the body, very common. It occurs in the majority of women between thirty-five and fifty, and most of the patients have given birth to one or more children. It forms 90 per cent. of the total number of cases of cancer of the female genital organs and 95 per cent. of the cases of cancer of the uterus.

#### CAUSE.—

Those authorities who have investigated the subject are of opinion that cancer is not hereditary but, on the other hand,

its incidence is so common that it is not surprising that it should affect members of the same family.

The cause of cancer is not known. There is, however, one certain fact about cancer which is that it frequently follows on certain varieties of chronic and prolonged irritation. Thus, as examples, cancer of the lip is associated with the long-continued irritation of smoking a clay pipe ; of the tongue with



FIG. 27.—Uterus cut in half to show cancer of the neck of the uterus. The cancer is growing from the vaginal portion of the neck of the uterus into the vagina.

irritation of a jagged tooth ; of the hands among tar workers, and of the scrotum among mule-spinners, due to irritation of oil on the trousers. Cancer of the intestine is more often present at sites where fæcal irritation is more likely, such as the cæcum, hepatic and splenic flexures, the sigmoid colon and the rectum. It may be, therefore, that the laceration of the cervix uteri which is so frequently associated with chronic



endocervicitis and erosion, and is so common in women who have borne children, is a predisposing cause, and one reason why cancer of the neck of the uterus is so much more common than cancer of the body of that organ.

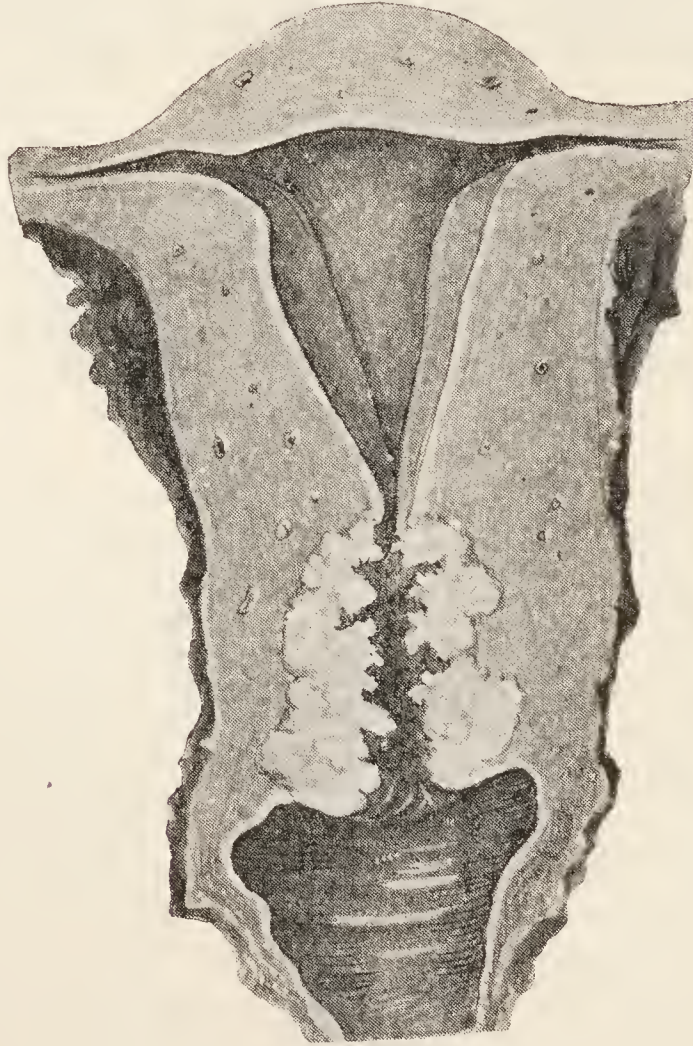


FIG. 28.—Uterus cut in half to show cancer of the neck of the uterus. In this case the cancer is growing from the cervical canal upwards. It does not project into the vagina, so that a doctor on making a vaginal examination would not feel it.

#### SYMPTOMS AND SIGNS.—

Hæmorrhage ; leucorrhœa ; pain ; cachexia.

**Hæmorrhage.**—This is the earliest symptom both in cancer of the body and cervix.

Such hæmorrhage may declare itself first as an excess at the period or, in the case of cancer of the neck, it may come on between the periods as a result of exertion, of douching,

or of coitus. *Hæmorrhage after the menopause is most likely to be due to cancer of the body.*

At times the hæmorrhage is severe, but only seldom is it the immediate cause of death, and then only at a late stage when the ulceration has extended into the uterine artery. The bleeding is usually due to rupture of the small blood-vessels in the tumour.

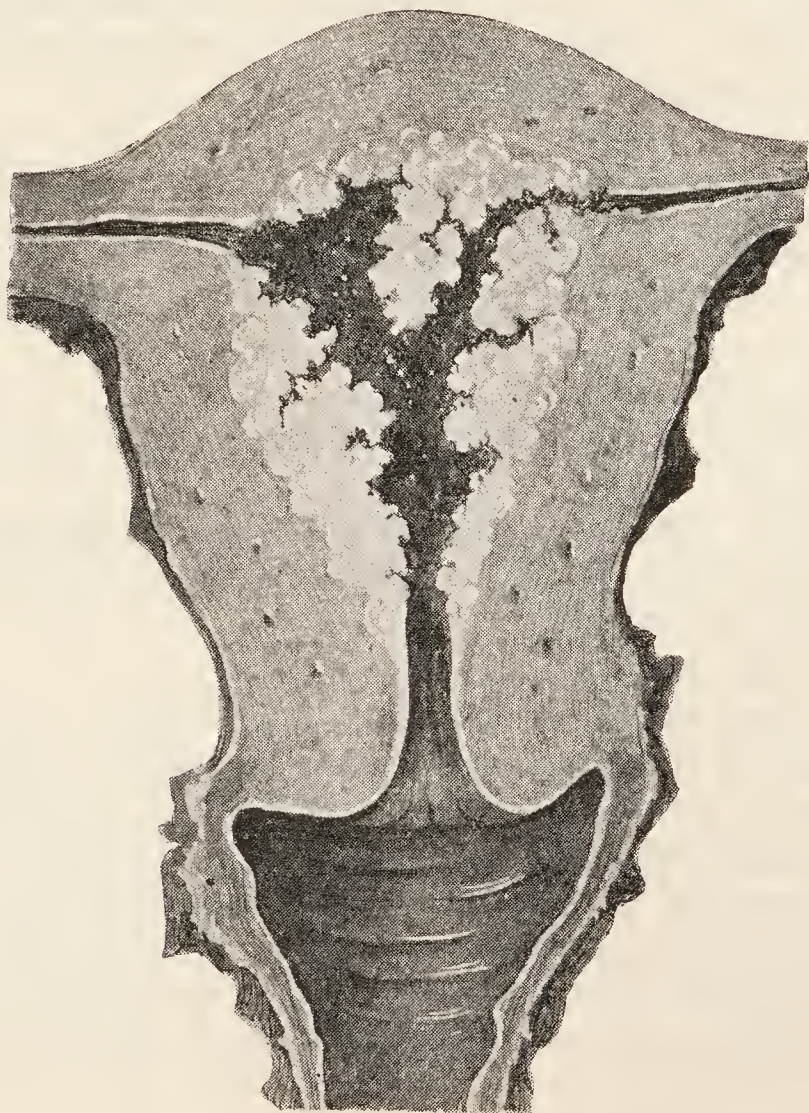


FIG. 29.—Uterus cut in half to show cancer of the body of the uterus.  
The neck of the uterus is not involved.

**Leucorrhœa.**—This is at first due to congestion, and is not offensive. In the later stages it is due to ulceration and septic infection of the growth, and the discharge is then horribly offensive. Unfortunately, women often apply for advice only when the offensive discharge appears, and then it is frequently too late for any treatment to be successful.



**Pain.**—This is a variable symptom. In cancer of the cervix pain does not appear till late in the disease because this part is not sensitive. The pain is due to the growth spreading to surrounding structures. In cancer of the body, on the other hand, pain is much earlier, as this part of the organ is more sensitive.

**Cachexia.**—Signifies the yellow earthy appearance, due to absorption of the septic products in the last stages of the disease. It is accompanied by the symptoms of wasting, loss of appetite, and exhaustion.

#### DIRECTION IN WHICH THE CANCER SPREADS.

*Downwards.*—On to the vagina, implicating the urethra, and so causing painful micturition and eventually retention of urine.

*Upwards.*—To the peritoneum.

*Forwards.*—Into the bladder, causing cystitis and a vesico-vaginal fistula.

*Backwards.*—Into the rectum, causing a recto-vaginal fistula.

*Outwards.*—Into the broad ligaments fixing the uterus and implicating the ureters.

#### CAUSES OF DEATH.—

The commonest cause of death is exhaustion. After this uræmia claims the greatest number of victims, and is due to the cancer growing into the ureters and preventing the proper excretion of waste products from the kidney.

The remaining causes of death are hæmorrhage, septicæmia, embolism, peritonitis, intestinal obstruction, and secondary deposits in the spine, brain, lungs, liver, and other organs. When compared with the first two causes, the remainder are rare.

#### TREATMENT.—

The treatment aiming at a cure is operative, or by radium and X-rays.

*Operative Treatment.*—If a patient suffering from cancer of the cervix is seen sufficiently early, removal of the uterus, the cellular tissue in its neighbourhood, the local lymphatic glands, and the upper part of the vagina (Radical Hysterectomy) by an expert in this class of surgery will certainly lead to the



cure of a large number of patients. The most successful operations have a five year cure rate of between 30 and 34 per cent. of cases. Unfortunately, many of the patients are first seen by the gynæcologist when the disease is so far advanced that a cure is problematical, or such an operation impossible.

Cancer of the body of the uterus can usually be cured by a total hysterectomy (not of a radical nature) if not seen too late for operative treatment.

There are various reasons why delay in seeking advice occurs. To begin with cancer very commonly appears about the menopause, and the patient thinks, or is told by her friends and even, unfortunately, in some cases by a nurse or her doctor, that the bleeding she complains of is nothing to be alarmed at, and that it is due simply to the "change of life," and so precious time is wasted.

Then many patients bleed only a little and they are not alarmed till the offensive discharge appears, when it is often too late for any treatment to have a fair chance of cure. Pain, again, in most cases is a very late symptom; many women shrink from consulting a medical practitioner, dreading a local examination; and, lastly, others have the fixed idea that cancer is incurable, so are not anxious to learn the worst. Patients are so often ignorant of the early symptoms of cancer that a great responsibility rests on the nurse if she is first consulted by a woman complaining of the above-mentioned symptoms.

Every nurse, therefore, should know the symptoms of cancer of the uterus, so that when she meets a woman complaining of any of them she can advise her to at once consult a doctor.

*It is now proved beyond doubt that cancer of the uterus is curable if only the patient is treated at an early stage of the disease.*

*Palliative Treatment.*—This consists in remedies for the bleeding, discharge, and pain.

For the bleeding the doctor will prescribe ergot, and other drugs, or he may curette the growth. The nurse may be called upon to treat a sudden severe hæmorrhage, in which case she should give hot douches (110° F.), and if this does not stop the bleeding the vagina may have to be plugged.

Leucorrhœa will be treated by various douches, those

helping to destroy the odour, such as iodine, sanitas, or permanganate of potash, being most often used. The growth may be curetted.

The discharge may also cause pruritus, which can be treated first by douching and then by smearing the vulva with a mixture of equal parts of castor oil and zinc ointment.

The best method of diminishing the odour in advanced cases is found to be scrupulous cleanliness (the pads, sheets, nightgowns being changed whenever soiled), douching, and plenty of fresh air in the room.

Pain is a distressing complaint. It is best treated by changing the nature of the analgesic directly it commences to lose its effect. Towards the end, injections of morphia will have to be given. As a routine treatment it has been found in the Cancer Wing of the Middlesex Hospital that aspirin gives the most relief before the administration of morphia becomes necessary.

What with the pain, bleeding, discharge, emaciation, the results of vesico-vaginal and recto-vaginal fistulæ and perhaps bed-sores which attend these pitiable cases in the last stages of cancer, only a thoroughly trained nurse is capable of properly looking after them.

*Radium Treatment.*—Treatment of cancer of the cervix by the application of radium, when properly carried out, has proved to be in the hands of many gynæcologists, and in the case of very large numbers of patients, a very successful method. The relative merits of the radical operation and the application of radium cannot be discussed with any advantage here. Taking the results of recognized experts, the percentage of women who have had cancer of the uterus and are free from recurrence after five years is more or less equal in both methods of treatment, while the immediate mortality for the radium treatment is under 1 per cent., whereas that of the radical operation, depending on the skill of the operator, varies between 15 and 25 per cent., the average of the leading operators being 17 per cent. The operative mortality in early cases is 5 per cent. It is obvious, therefore, that if one is concerned only with the immediate mortality there can be no question as to which is the best method of treatment.

On the other hand, the radiologists do not cure such advanced cases as the most expert surgeons, and that, therefore, the latter save a certain number of women who would otherwise perish. The radiologists, nevertheless, contend that this fact is more than counterbalanced by the increased operative mortality following the radical operation. The percentage of recoveries after five years in the case of the radium treatment, however, includes a far greater number of early cases than those treated by the radical operation.

One objection taken to the treatment by radium is that its sphere of action is very limited, and that, therefore, if there are carcinomatous glands present these cannot be destroyed. It is claimed that this drawback has been surmounted by using X-rays in addition to the radium.

A doctor has a very responsible and difficult position when he is asked by his patient which method of treatment should be followed. Probably in early cases the radical operation is most likely to lead to a cure because the regional lymphatic glands can be removed at the same time. It is a fact, however, that the radical operation is being given up by expert operators all over the world in favour of the radium and X-ray treatment.

## SARCOMA OF THE UTERUS.

This form of malignant disease of the uterus is very rare. Since the symptoms and signs of sarcoma, so far as a nurse is concerned, are comparable to those of carcinoma in that organ, they need not be further considered. One variety occurs in the neck of the uterus in very young children.

The duties of the nurse are the same as described for carcinoma.

## CHORION-EPITHELIOMA.

This is a very rare and intensely malignant form of disease. The tumour consists of a mass of trophoblastic cells (those cells forming the outer layer of chorionic villi) and maternal blood. From the nature of the tumour it is obvious that the patient must have been pregnant.

The history of such a case is that some time after a miscarriage or labour the patient suffers from severe bleeding.



As parts of the tumour necrose there is an offensive discharge. Since fever is not unlikely to be present such cases are, at times, attributed to puerperal sepsis. On the other hand, they may just be attributed to subinvolution of the uterus and only on an intra-uterine examination is the nature of the disease discovered. Secondary deposits appear early in the lungs giving rise to hæmoptysis, and in other organs of the body. Most of the patients die in a few months in spite of hysterectomy. A few have recovered.

## CHAPTER XXIV.

### OVARY.

OVARIAN tumours are either cystic or solid. Ninety-five per cent. of tumours are cystic.

#### CYSTIC OVARIAN TUMOURS.

Cystic ovarian tumours may be classified into follicular, glandular, embryonal, and papillomatous, the difference depending upon their structure and the nature of the fluid they contain. Ovarian cysts may be innocent or malignant and unilateral or bilateral.

**Follicular Cysts.**—These tumours originate in Graafian follicles or in corpora lutea, except the endometrial cyst, which is due to transplantation of endometrium. They do not grow to any large size.

The fluid in the endometrial cysts is menstrual blood (chocolate cysts of the ovary). The fluid in the other two cysts is clear and straw-coloured.

**Glandular Ovarian Cysts.**—These tumours are more complicated in structure. They may be unilocular or multilocular. The walls of the cyst are partly composed of glands, and the fluid they secrete (mucus) is thick, tenacious, and greenish in colour, if not altered by inflammation or bleeding, when it may be yellow from the presence of pus, or red, chocolate-coloured, or black from mixture with blood. Should the mucus escape into the peritoneal cavity, following rupture of the cyst, it does not do any immediate harm, but, as the glands in the cyst-wall continue to secrete, the mucus gradually distends the abdomen to such an extent that life may be endangered from the pressure the fluid exerts.

A certain proportion of glandular ovarian cysts are malignant.

The cancer, however, has not always started in the ovary. It may have started, for instance, in the breast or stomach and spreading by the lymphatics affected the ovary secondarily.

**Embryonal Cysts.**—These tumours, commonly called dermoid cysts, are very interesting, inasmuch as they may contain teeth, hair, bones, breast-tissue on which may be situated nipples, nervous-tissue, skin, mucous membrane, sweat and fat glands. Of these, teeth are most commonly present, as a rule only two or three, but over a hundred have been found. The length of the hair varies, generally it is short, but it has

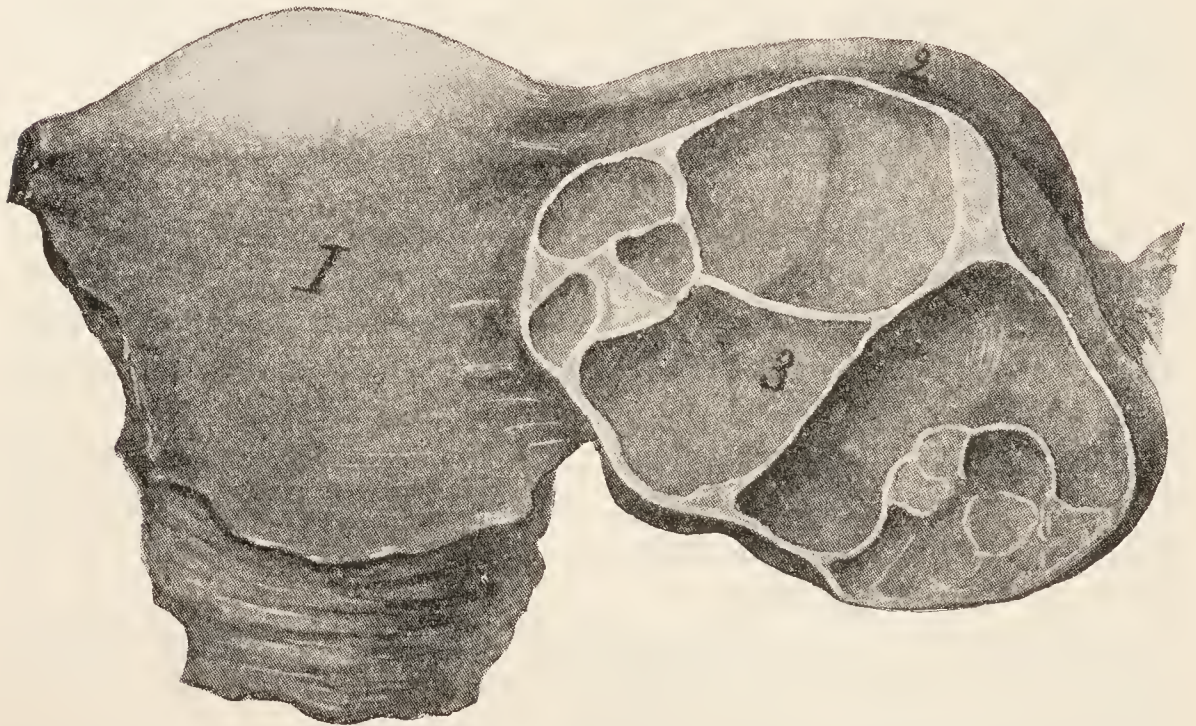


FIG. 30.—Ovarian cyst cut in half to show the compartments in one variety of cyst, the multilocular. 1. Uterus ; 2. Fallopian tube ; 3. Ovarian cyst.

been found several feet long. The colour does not correspond with that of the patient's hair, but it becomes grey with old age. At times these structures are arranged in such a way that they appear very like an embryo without its head but with limbs, attached to the wall of the cyst and projecting into its cavity. The source of origin of these tumours is still a matter of speculation, and there is no need here to discuss the various theories.

The fluid the cyst contains is liquid fat, and if the contents of the cyst escape into the peritoneal cavity severe inflamma-



tion may be set up (peritonitis), causing the death of the patient.

**Papillomatous Ovarian Cysts.**—Attached to the wall of these cysts and projecting into their cavities are small papillomatous processes having the appearance of warts, hence their name. If these wart-like structures escape into the peritoneal cavity they become adherent to the viscera and peritoneum, and continue to grow, and as a result fluid accumulates in the peritoneal cavity.

These papillomatous growths are of two varieties, malignant and non-malignant. The former continue to grow till the patient dies. The latter live only a certain time and then disappear; but as their place is taken by others the result, if the tumour is not removed, is the same as if they were cancerous. On the other hand, if the tumour is removed, then in the non-malignant variety the patient recovers, because the growths that are adherent to the viscera at the time of the operation disappear soon afterwards and there are no fresh ones to take their place.

In the case of the malignant variety removal of the tumour will not cure the patient if any of the papillomatous growths have once escaped from the cyst and become implanted elsewhere since, although fresh growths cannot become engrafted, yet those already present continue to grow. The growths escape by rupture of the cyst or perforation of its wall.

#### SYMPTOMS AND SIGNS.—

*Enlargement of the Abdomen.*—This depends on the size of the cyst.

*Amenorrhœa.*—Unless it is due to depreciation in health, amenorrhœa in association with ovarian cysts results only when the ovarian tissue of both organs is destroyed. After the menopause ovarian tumours may cause a loss of blood from the uterus.

*Pressure.*—Pressure on the bladder and rectum gives rise to frequency of micturition, constipation, and hæmorrhoids; on the stomach to indigestion; on the diaphragm it impedes the action of the heart and of the lungs, and on the veins it causes œdema of the legs and ascites.

*Emaciation.*—If the disease is advanced, or if suppuration

has taken place in the cyst, the patient becomes emaciated, as also she does if the cyst is malignant.

#### METHODS BY WHICH OVARIAN TUMOURS ENDANGER LIFE.

By their size.

By the complications of rupture, inflammation, twisting of the pedicle or hæmorrhage.

By their being malignant.

By their association with pregnancy, labour, or the puerperium.

By pressure on the ureters.

By intestinal obstruction.

#### Size.—

It is unusual nowadays to meet with large ovarian cysts.

In olden days ovarian cysts of enormous size were quite common, and even nowadays, in out-of-the-way places which doctors do not often visit, among uncivilized nations, or in women who refuse to consult a doctor or listen to his advice, very large tumours may occasionally be found.

One of the largest on record weighed 227 pounds, the fluid it contained measuring 88 quarts.

#### Rupture.—

##### CAUSE.—

An ovarian cyst may be ruptured by the wall becoming so thin from pressure of the contained fluid that it tears, or the wall of the cyst may become diseased and give way, or by papillomatous growth perforating its wall. Rupture may also be caused by blows or falls, especially against some sharp object such as the edge of a table ; during labour ; by twisting of the pedicle ; by compression of the tumour by the abdominal muscles and contents during laughing, coughing, or stooping to button the boots, and during examination by the doctor.

A case is on record on which a patient with an ovarian cyst was ascending in a lift, the machinery of which broke. The concussion, caused by the lift falling, burst the cyst and the patient was cured.

## SYMPTOMS.—

The symptoms attending the rupture of an ovarian cyst may be divided into immediate and remote.

*Immediate Symptoms.*—Sudden pain in the abdomen and disappearance of the abdominal swelling if there is one; in addition there may be symptoms of internal hæmorrhage if a blood-vessel is severed and remains patent, when the cyst wall is torn.

*Remote Symptoms.*—These depend on the nature of the fluid contained in the cyst. For instance, in a follicular cyst harm may not result; in a glandular cyst the mucus which is secreted will gradually fill the abdominal cavity and may kill the patient if it is not removed; in an embryonal cyst the contents are likely to set up peritonitis, which may be fatal. In a papillomatous cyst the growths, becoming scattered, cause a large amount of fluid to collect in the abdominal cavity.

In the olden days when ovariectomy was not performed, patients were tapped when the accumulation of fluid became too great. As an example of the amount of fluid which can be secreted by an ovarian cyst, the following is an account of a specimen preserved in the museum of the Royal College of Surgeons: “The patient was twenty-seven years old when the disease commenced, after a miscarriage of her first child. Between the year 1757 and August, 1783, when she died, she was tapped eighty times, and a total of 6631 pints, or over thirteen hogsheads, were removed from her.” Just before her death the fluid accumulated at the rate of  $3\frac{1}{2}$  pints a day.

## Inflammation.—

## CAUSE.—

An ovarian cyst may become infected from organisms escaping from the intestine, the vermiform appendix, or Fallopian tube.

A patient with an ovarian cyst and suffering from puerperal sepsis, or typhoid fever, may have the cyst infected by the streptococcus or, respectively, typhoid bacillus. An ovarian cyst may be bruised during labour and then inflame. The commonest cause of inflammation of an ovarian cyst is twisting of its pedicle.



If the inflammation is acute the cyst becomes filled with pus, and unless the tumour is removed, or the pus bursts into the intestine, bladder, vagina, or through the abdominal wall, she must die. Even if the pus does escape through one of these channels the patient will eventually die unless the tumour is removed.

In less acute cases adhesions are formed so that the cyst is bound down to the structures in its neighbourhood, and its removal becomes a highly dangerous procedure.

#### SYMPTOMS AND SIGNS.—

The symptoms of inflammation are great abdominal pain, and those of fever. The pulse-rate is rapid, the temperature high with marked intermissions, the abdominal swelling if there is one is very tender and tense, and there is emaciation.

**Twisting of the Pedicle.**—Ovarian cysts are attached to the uterus and broad ligaments by a stalk composed of the ovarian blood-vessels and other structures, and this stalk is called the pedicle. Under certain conditions this pedicle becomes twisted, with the result that several well-defined symptoms appear.

The torsion may occur slowly or suddenly.

#### CAUSE.—

Twisting of the pedicle is due to a rotatory movement of the ovarian cyst. This may be brought about by the resistance of swellings in its immediate neighbourhood, such as a pregnant uterus or a fibroid tumour of the uterus, or another ovarian cyst. Twisting of the pedicle has also been thought by some to be due to the alternate filling and emptying of the bladder and rectum, and its occurrence after labour is probably due to the rapid decrease in size of the uterus.

When the pedicle is twisted the veins in it are occluded, while the arteries remain patent. Blood which is pumped into the cyst wall by the ovarian artery, is, therefore, unable to escape by the ovarian vein, with the result that the cyst soon becomes very congested.

Some of the small blood-vessels in the wall of the cyst then burst, and blood is extravasated into the cyst wall. In addition, a larger vessel may rupture when blood escapes into the cyst cavity, which may then become so distended that its wall tears.

## SYMPTOMS AND SIGNS.—

As a rule the twisting occurs slowly. The patient in this case complains of recurrent abdominal pain, and the tumour is tender. If the twisting is acute there is sudden and great abdominal pain, accompanied by vomiting. The condition is one of “acute abdomen,” and, if the presence of the tumour remains undetected, the condition may be diagnosed as acute intestinal obstruction or appendicitis. In addition, if any large blood-vessels have ruptured there may be the symptoms of internal hæmorrhage.

In a certain percentage of cases there will also be present, in a day or two, symptoms of inflammation of the cyst. The

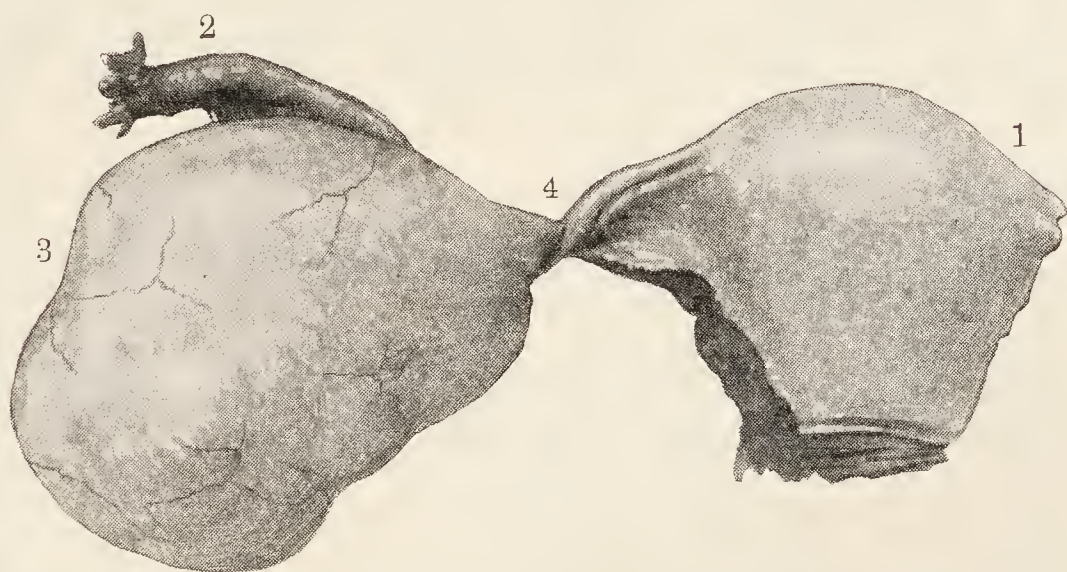


FIG. 31.—An ovarian cyst with a twisted pedicle. 1. Uterus ; 2. Fallopian tube ; 3. Cyst ; 4. Twisted pedicle.

signs are those of rupture, inflammation, or hæmorrhage as the case may be.

**Hæmorrhage.**—

## CAUSE.—

Bleeding from the wall of an ovarian cyst may be due to its rupture, to twisting of its pedicle, to suppuration into a blood-vessel, or to a papillomatous growth penetrating a blood-vessel in the cyst wall.

## SYMPTOMS AND SIGNS.—

The symptoms and signs of bleeding from, or into, an ovarian cyst are those of internal hæmorrhage, together with pain, and if the cyst has ruptured, those of this complication.

**Cancer.—****SYMPTOMS AND SIGNS.—**

Whether an ovarian cyst is malignant or not can be determined for certain only by a microscopical examination of the tumour after its removal, unless the tumour is secondary to carcinoma in some other organ, or secondary growths are found in the omentum and elsewhere. The fact that the tumour has grown rapidly, that it is bilateral, that the patient is emaciated, that there is marked ascites and unilateral œdema of the legs and vulva should awaken suspicion of malignancy. Bleeding from the uterus after the menopause, in association with an ovarian cyst, suggests that the latter may be malignant. Cancer of the ovary is frequently secondary to cancer of the stomach, large intestine, liver, breast, and uterus.

**Pressure on the Ureter.—**

Very large cysts, or cysts, tightly impacted in the pelvis may press dangerously on the ureters.

As a result albuminuria is likely to arise, and later, if the tumour is not removed, the kidneys become irretrievably damaged, and the patient dies from uræmia.

**Obstruction of the Bowels.—**

The bowels may be obstructed by becoming adherent to the tumour or by a portion of them becoming caught in the pedicle when it twists.

**Associated with Pregnancy.—**

The pressure symptoms of pregnancy become more marked. Vomiting is likely to be troublesome. The patient may miscarry. There is a predisposition to albuminuria and eclampsia. The cyst may cause retroversion of the gravid uterus, which may then become incarcerated and miscarriage may occur.

The cyst grows more rapidly. It may rupture, its pedicle may become twisted, it may inflame, or it may become impacted below the uterus so interfering with micturition and defæcation.



### Associated with Labour.—

The cyst may cause obstruction if in the pelvis, so preventing the head from descending, or if in the abdomen, so causing some malpresentation of the child. As a result of such an obstruction the uterus may rupture.

The contracting uterus may cause twisting of the pedicle, it may rupture the cyst, or it may bruise the cyst wall so that later it inflames.

### Associated with the Puerperium.—

As a result of the twisting of the pedicle, or bruising during labour, the cyst may become inflamed. The patient then becomes septic, and if the tumour is not discovered the condition is disguised as puerperal fever. There have been many cases of such a mistaken diagnosis, discovered on post-mortem examination.

The pedicle of the cyst may become twisted, or in cases of septicæmia the cyst may become infected and suppurate.

### TREATMENT.—

*Every ovarian cyst should be removed as soon after its discovery as possible.* This does not mean that necessarily the whole ovary should be removed. In many cases it is found that the cyst can be dissected out and a portion of the ovary left. This should always be done if possible. If there is any reason to suspect that the cyst is malignant, then the whole ovary should be removed as it should be in papillomatous cysts.

An ovarian cyst should be removed for the following reasons :—

With the rare exception of a follicular cyst bursting and becoming cured, the cyst will certainly kill the patient in the end. It is liable to serious complications. The longer it is left the more dangerous may be its removal. It may be malignant, when the only chance the woman has of a cure lies in its removal before the cancer has spread to other structures.

This rule admits of but very few exceptions which, in the absence of some complication in the tumour, are—

1. If the patient is so desperately ill that an anæsthetic or operation would kill her, the tumour must then be tapped.

2. If the tumour complicates pregnancy and the mother is a primigravida within a few years of her menopause. Since 19·5 per cent. of pregnant women miscarry when operated upon for an ovarian cyst it would be wiser to wait, if possible, till the pregnancy was at its 34th or 36th week, when the child will have a good chance of surviving, since the patient, because of her age, may not again become pregnant.

3. When complicating pregnancy there are two ovarian tumours, in such a case the patient will have only this one chance of having a child, and since there is a danger of miscarriage if an operation is performed, the patient may decide to postpone the operation if possible till the 36th week.

## SOLID OVARIAN TUMOURS.

Solid ovarian tumours may be unilateral or bilateral and malignant or non-malignant. The commonest non-malignant variety is a fibroid tumour similar to that found in the uterus.

### SYMPTOMS.—

Solid ovarian tumours do not give rise to much trouble in their early stages. They are generally discovered accidentally, except in the case of the malignant forms which after some time, owing to their invasion of adjacent structures, and effect on the general health of the patient, cause her to seek advice.

### TREATMENT.—

Solid ovarian tumours should be removed at the earliest opportunity since there are no certain means of telling whether the tumour is malignant or not.

## BROAD LIGAMENT CYSTS.

It is not at all necessary here to discuss this variety of cyst, often termed a *parovarian cyst*. These cysts arise in certain developmental structures situated between the two layers of the broad ligaments, and are unilocular. The fluid content is clear and like water, and harm does not result, perhaps a cure, if the cyst bursts. The symptoms and signs are similar to those of ovarian cysts.

## INJURIES.

The uterus, vagina, labia, and perineum may be torn during labour. The vulva and vagina may be injured by an accident, or as the result of violence or rape. A tear in the perineum may extend into the rectum during instrumental delivery, or during the otherwise normal birth of the child, resulting later, perhaps, in a recto-vaginal fistula. The vagina may be bruised by pressure of the head of the child if it is delayed in the cavity of the pelvis, and sloughing into the bladder a vesico-vaginal fistula is formed in five days. Such a fistula may also be caused at once by injury with the forceps during instrumental extraction of the child.

The Fallopian tube may be torn as a result of pregnancy occurring therein.

## MALFORMATIONS.

The internal genital organs are developed partly from certain cells found in the embryo each side of its spine, and partly from two solid columns of cells which eventually become canalized, the tubes being named the Mullerian and Wolffian ducts, which extend from the region of its kidneys to its pelvis.

The cells become either ovaries or testes according to the sex. The upper parts of the Mullerian ducts form the Fallopian tubes and then uniting form the uterus. The Wolffian ducts unite to form the vagina.

The external genital organs are formed by certain folds and dimples in the skin.

Malformations of the genital organs are of two kinds, either the sexes may be combined, or the organs peculiar to one sex or the other may not become properly developed.

**Combination of the Sexes.**—Owing to some error in development, either in the cells or in the tubes, or in the foldings of the skin, an individual may have the internal genital organs of a woman and the external genital organs of a man, or *vice versa*. Such individuals are often called hermaphrodites, but true hermaphrodites must have a complete set of male and female genital organs. In the human



race, however, no case has been reported in which in addition to all the other genital organs there were present ovaries and testes. In all cases reported there have been only one set of these organs present, either ovaries or testes, and the proper term for such an individual is a pseudo-hermaphrodite.

**Genital Organs not Properly Developed.**—It is necessary here only to discuss the result of such maldevelopment in females. If the Mullerian and Wolffian ducts remain separate, then the woman has a double uterus and vagina.

If the ducts join first at the level of the vagina then she has a double uterus. If the column of cells which would form the vagina do not become canalized, the vagina is absent, or part may become canalized and part not.

The internal and external genital organs become connected by the Wolffian ducts growing downwards towards the dimpling in the skin which forms the vulva. A membrane is formed where these two meet, just at the vulval orifice, and is called the hymen. By the perforation of this membrane the vulva leads into the vagina. If this perforation does not take place the condition known as imperforate hymen results, which leads to the menstrual flow being retained from the onset of puberty (see p. 19).

Lastly, if the cells or ducts develop true to sex but not completely, the ovaries, Fallopian tubes, uterus or vagina may be very small and unable to perform their functions.

## PART XIV.

### GYNÆCOLOGICAL NURSING.

#### THE BEARING OF A NURSE.

A FULLY-trained nurse is one who has developed and brought to a fine art the care and management of the sick, having a sympathetic and intelligent grasp of the theory and practice of nursing.

To have reached such a stage, a nurse must have spent at least three years in a recognized training-school where all her faculties should have been exercised to the perfecting of each detail of her work, in no way overlooking the fact that this training is useless unless her character has developed along sound and strong lines, and she has cheerfully responded to the stern discipline which alone can make productive those qualities which are essential to her calling. Taking character as the foundation of a good nurse, an implicit and unquestioning obedience to all instructions received from those in authority is required together with absolute loyalty, a wise energy, and a forgetfulness of self in the love of the work she has undertaken.

Such a nurse will perform her duties with a freedom from self-consciousness and a quiet reserve which cannot fail to elicit the respect of those with whom and for whom she works, and in so doing will uphold the status of the profession she represents.

Manners are often overlooked in a nurse's training, due probably to the rush of her work, and she may be in danger of losing the confidence of her patient through an appearance of hurry which must therefore be wholly foreign to her nature.

Towards patients and strangers alike a nurse should be at

all times courteous, sympathetic, and helpful, but in every way free from familiarity.

The essential qualities then of a fully-trained nurse are sympathy apart from sentimentality ; an intimate knowledge of all the details of her work which will serve to inspire confidence in patients and doctors alike ; a cheerful self-forgetfulness, holding sacred any information confided to her by doctor or patient, ever avoiding all conversation of a personal nature ; and lastly, accuracy and minute attention to detail. These latter qualities a nurse only acquires in her probationer days, when her habits are being formed and her powers of observation developed by the routine ward-work, rough and heavy though it may have seemed, for only by such work can she become alert, quick, and have gained that observant and practised eye by which all details of a sick-room and all wants of a doctor are grasped without effort.

The natural outcome of such attributes will be punctuality, neatness, quietness, cleanliness even to the minutest detail, method, and order.

All this is but an outline of what might almost be described as a limitless subject, on the bearing of a nurse towards her patients, doctors, fellow-workers, and the public at large.



## CHAPTER XXV.

### METHODS OF STERILIZATION.

STERILIZATION can be effected by means of heat or chemicals.

#### Heat.—

Heat may be used for sterilizing in two ways, either in the form of dry heat or moist heat, the latter being employed in the form of water or of steam.

*Baking.*—Dry heat at a temperature of  $150^{\circ}$  C. will kill spore-forming bacteria if exposed to it for an hour. Its application for this object has, however, the disadvantage that heat penetrates badly, and so bacteria in the middle of an article may escape destruction. For gynæcological purposes this method is not a useful one, since the oven will take small articles only, and cotton, linen, and flannel goods will be scorched.

*Boiling.*—For articles that can be used directly after being boiled this is the most convenient method of sterilization. Instruments, silk, thread or silkworm gut ligatures and sutures, and india-rubber gloves are usually so treated, while towels and swabs can be if steam is not available. The sutures and ligatures should be boiled for one hour, the remaining articles for at least 20 minutes.

*Steaming.*—Steam under pressure is the best method for sterilizing towels, dressings, swabs, operating-gowns, masks, and such-like articles. Bedding and clothing are also most efficiently sterilized by this method. Leather, felt, skins, and macintoshes cannot be steamed.

India-rubber gloves are in many hospitals sterilized by steam. The method is entirely efficient but very extravagant since the rubber perishes quickly, and in many cases the gloves

can be used once only. As a matter of fact the *only* advantage of this method of sterilizing gloves is that they are easier for the surgeon to put on and, perhaps, rather more comfortable to wear, a high price to pay for such trifling objects.

A useful and efficient method of sterilizing dishes, trays, and such articles that will not be injured thereby, is to pour into or over them a small quantity of methylated spirit. The spirit is then set alight and allowed to burn itself out.

**Chemical.**—Too much reliance must not be placed upon the action of chemical substances as sterilizers, since when used of a strength that can be employed in antiseptic surgery, they may not kill, within reasonable time, the more resistant forms of even non-sporing bacteria. The following chemicals, among others, are used for sterilizing purposes :—

Mercury. Carbolic acid. Lysol. Monsol.

*Mercury.*—This is used in the form of its salts, the perchloride or biniodide. Perchloride and biniodide of mercury are very poisonous and are decomposed by lead, tin, and copper; a solution of these salts is more or less useless in the presence of albumin, forming with it an insoluble compound. Since albumin is contained in blood and other discharges from a wound, these substances must be washed away before the solution of mercury can kill the bacteria. Likewise soap must not be allowed to contaminate the mercurial solution. Perchloride of mercury corrodes metal and is the source of great irritation to the hands of some people.

Mercury is the strongest chemical suitable for the purpose of sterilization, but care must be taken in its use and, owing to its poisonous nature, its solutions must be prepared with the greatest care.

If a patient is poisoned with any preparation of mercury she will complain of a metallic taste, sore gums, colic, and nausea. She will suffer from salivation and diarrhœa. Her breath may be very offensive, and there may be blood in her motions. In bad cases the pulse is small and its rate rapid; the patient has an anxious expression, her skin is cold and clammy, and she may have suppression of urine.

For the catheter, douche-nozzle, vulva, and hands a solution of biniodide or perchloride of mercury, 1 in 2000, may be used. For the vagina and uterus a strength of 1 in 4000 is

sufficient. Many doctors order a douche of saline to be given after an intra-uterine or vaginal douche of mercury, to avoid the possibility of poisoning.

*Carbolic Acid*.—Carbolic acid is an uncertain chemical for sterilizing purposes unless it is used at such a strength that it will injure the tissues. It is, however, a good disinfectant. It has the advantage of not injuring the instruments or combining with albumin, so that it can be used in the presence of that substance. The first sign of carbolic acid poisoning is that the urine becomes green or greenish-black.

Carbolic acid is very useful for sterilizing macintoshes, dishes, and porringers, for which purposes its strength should be 1 in 20 (one ounce to a pint of water). For the skin, instruments, and hands 1 in 40 is strong enough.

*Lysol. Monsol*.—Belong to the carbolic acid group of chemicals. They are, however, not so poisonous, and rather more efficacious in their bactericidal properties.

For the skin, hands, and instruments they can be used at a strength of 1 in 160 (a teaspoonful to a pint of water), and for the vagina and uterus 1 in 320.

Because of the poisonous nature of these chemicals the nurse must remember to prepare the solutions for douching in strict accordance with the doctor's orders, and, in addition, when she is giving a vaginal douche, she must be sure that none of it is retained. To this end, therefore, after the douche-nozzle is withdrawn she should pull back the perineum and press upon the abdomen.

One of the most important lessons a nurse has to learn is that of surgical cleanliness. A thorough knowledge of the conditions of asepsis and antisepsis will certainly help but she must be able to carry into practice what she has learnt. One has often seen a nurse, whose knowledge of the principles of surgical cleanliness has been quite sufficient, fail in this respect through lack of care and strict routine. Thus a nurse will sterilize all the instruments and appliances, will dress herself in appropriate apparel, will scrub her hands and soak them in an antiseptic afterwards, but will then proceed to touch some object which has not been sterilized, be it the



patient, a piece of furniture, or even her cap ! after which she may, unless admonished, continue to help at the operation without again rendering her hands as aseptic as possible.

A nurse must remember when assisting with the instruments or swabs at the operation that, after having once rendered her hands and forearms as aseptic as possible, she must not touch anything that has not been sterilized till the operation is finished. Very rarely with insufficient assistance this may be impossible, in which case the nurse must again prepare her hands, or if, as she should be, she is wearing india-rubber gloves, she must wash them thoroughly in mercury solution or put on another pair.

### How to Disinfect a Room.

The nurse may be called upon to disinfect the room after it has been occupied by some septic case. The disinfection should be carried out as follows with the additional help that is necessary :—

All the linen that can be boiled should be placed in a solution of carbolic acid 1 in 20, or lysol 1 in 160, and then removed from the room.

The windows and fireplace should now be pasted up with brown paper so as to prevent any air from entering the room. Next, the blankets, mattress, and bolsters should be spread out, and all the drawers and cupboards should be opened so that their contents are exposed as much as possible.

A formalin lamp (which can be hired at a moderate charge from most chemists) should now be placed in the centre of the room, and after the lamp is lit the room should be left as quickly as possible, the door closed, and the keyhole and the junction of the door with its frame pasted over with strips of brown paper.

At the end of twelve hours the door, windows, and fireplace should be opened and the room exposed to the fresh air for some time.

Every article of linen or cloth that can be washed should be sent to the laundry.

The woodwork of the room and the furniture should be thoroughly scrubbed with soap and water. If the walls are

papered it is better that they should be stripped and afterwards washed with some disinfectant. If distempered or painted the walls should be sprayed with formalin and then washed down.

Books and papers used in the room should be burnt as they cannot be disinfected unless exposed to a degree of heat which would spoil them.

If a formalin lamp cannot be obtained, the room can be less efficiently disinfected with rock sulphur. Three pounds of this should be placed on a shovel with some red-hot cinders, the whole being placed over a bath of water, so that if any cinders should fall there would be no danger of fire. Sulphur candles are sold for disinfecting purposes.

## CHAPTER XXVI.

### POSITION OF THE PATIENT FOR EXAMINATION OR OPERATION.

IN gynæcological practice the nurse will be told by the doctor to place the patient in various positions according to the nature of the examination to be made, the treatment to be carried out, or the operation to be performed.

The nurse must make herself conversant with these various positions and should be able, without any delay or hesitation, to place the patient in the required position. It is very irritating to the doctor to discover, either that the nurse does not know what he means when he directs her to place the patient in a certain position or, if she does, that she is not capable of carrying out his directions. Nevertheless, it is not at all uncommon when operating in the house of a patient, and even in a Nursing Home, to find the nurse ignorant of such things, and an interrogation will elicit the fact that such ignorance is more often due to the nurse not having been trained in this respect (when she was in hospital) than to forgetfulness.

#### For Examination and Treatment.

**Recumbent Position.**—Doctors examine their patients, when consulted for symptoms of an obstetrical or of a gynæcological nature, by a routine method. First an examination of the breasts and abdomen is made, then an examination of the vulva, and lastly, if necessary, an examination of the vagina, uterus, ovaries, and Fallopian tubes.

The recumbent position is, therefore, the first to be assumed by the patient when such an examination is necessary.

In this position the patient lies on her back with her head and shoulders supported by a pillow. If in bed her nightgown should be drawn up so far as the breasts, and the lower



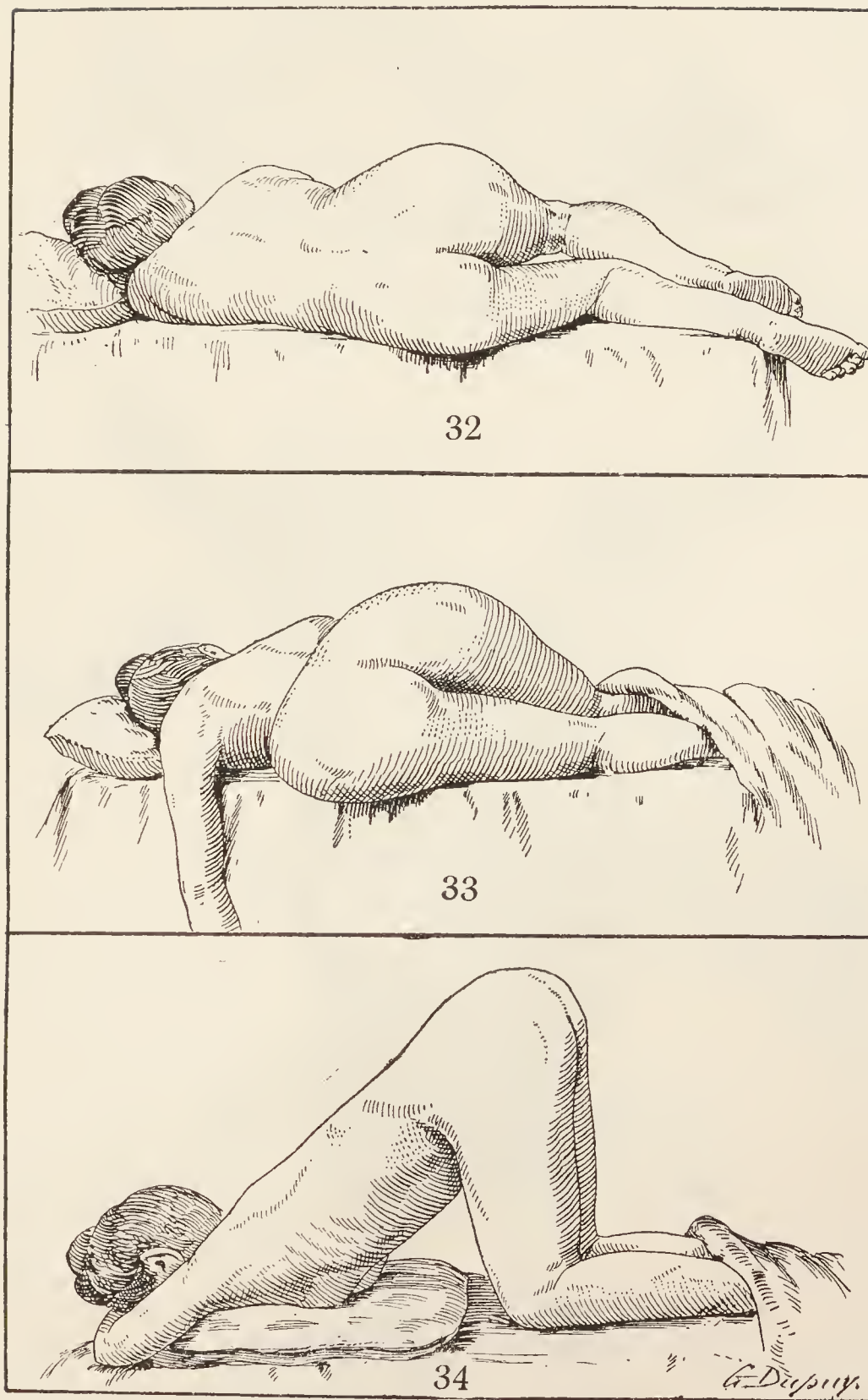


FIG. 32.—Left Lateral Position. FIG. 33.—Sims's Semi-prone Position. FIG. 34.—Knee-pectoral Position.

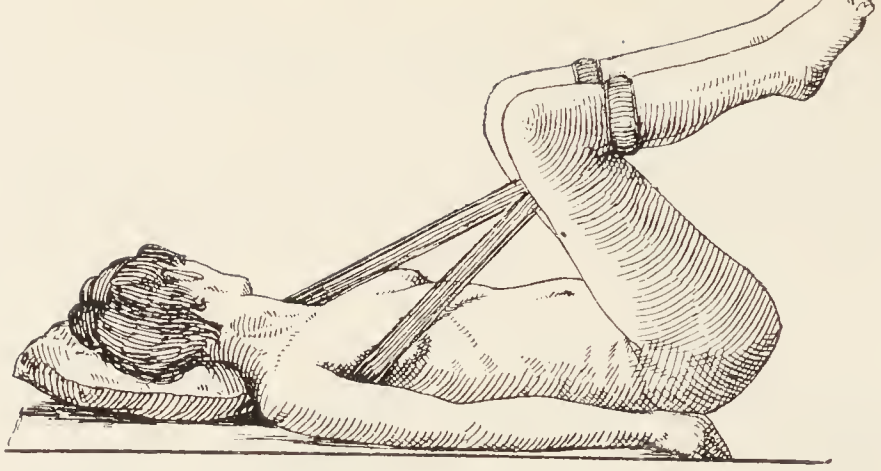


FIG. 35.—LITHOTOMY POSITION. Note that the cross-bar of Clover's crutch is applied below the knees, and the strap is over one shoulder and below the other.

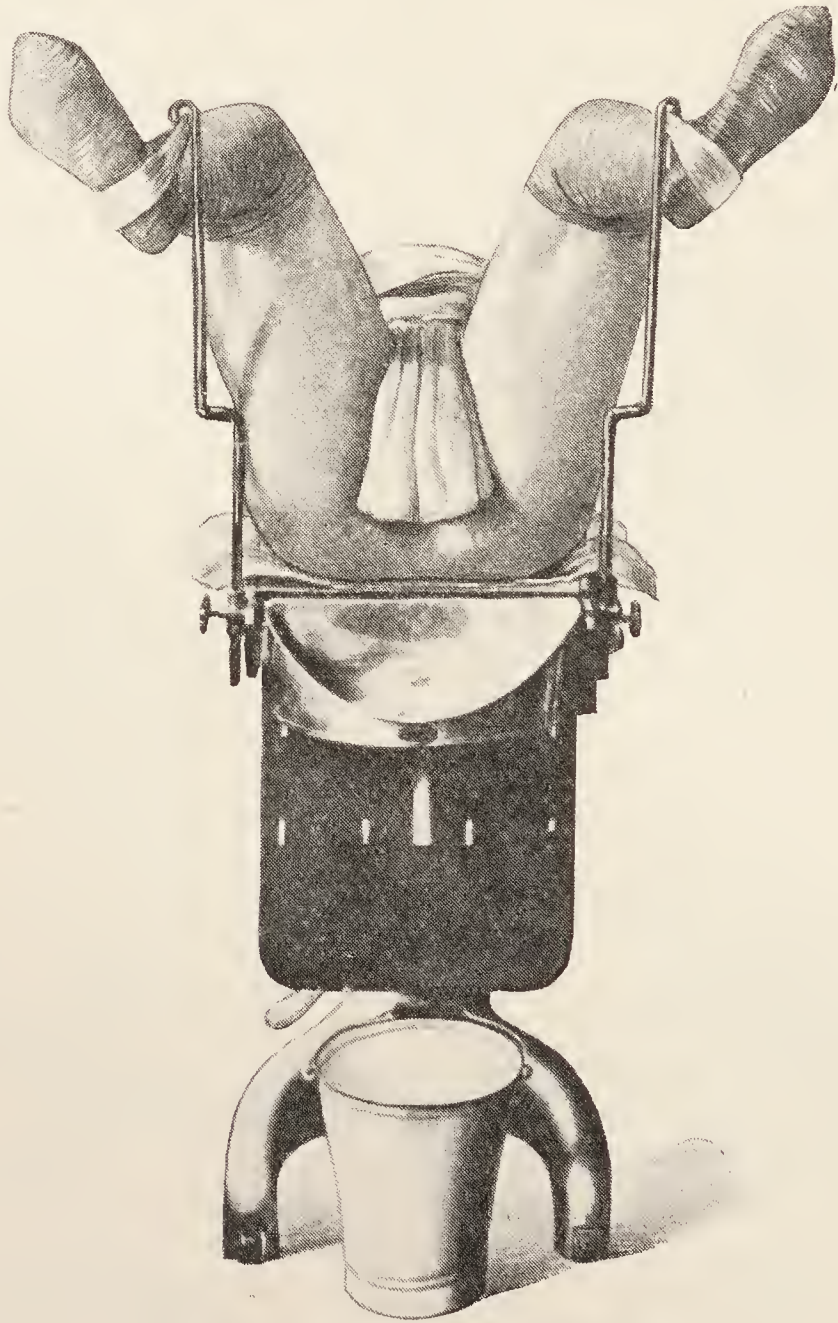


FIG. 36.—LITHOTOMY POSITION.  
To show the positions more plainly the sterilized coverings for the feet, legs, and perineum have been omitted.  
(Allen & Hanburys' St. Bartholomew's operating table.)



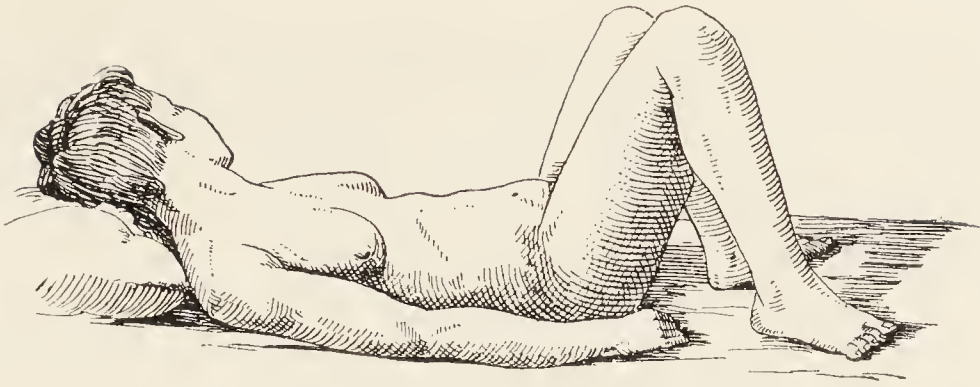


FIG. 37.—DORSAL POSITION.

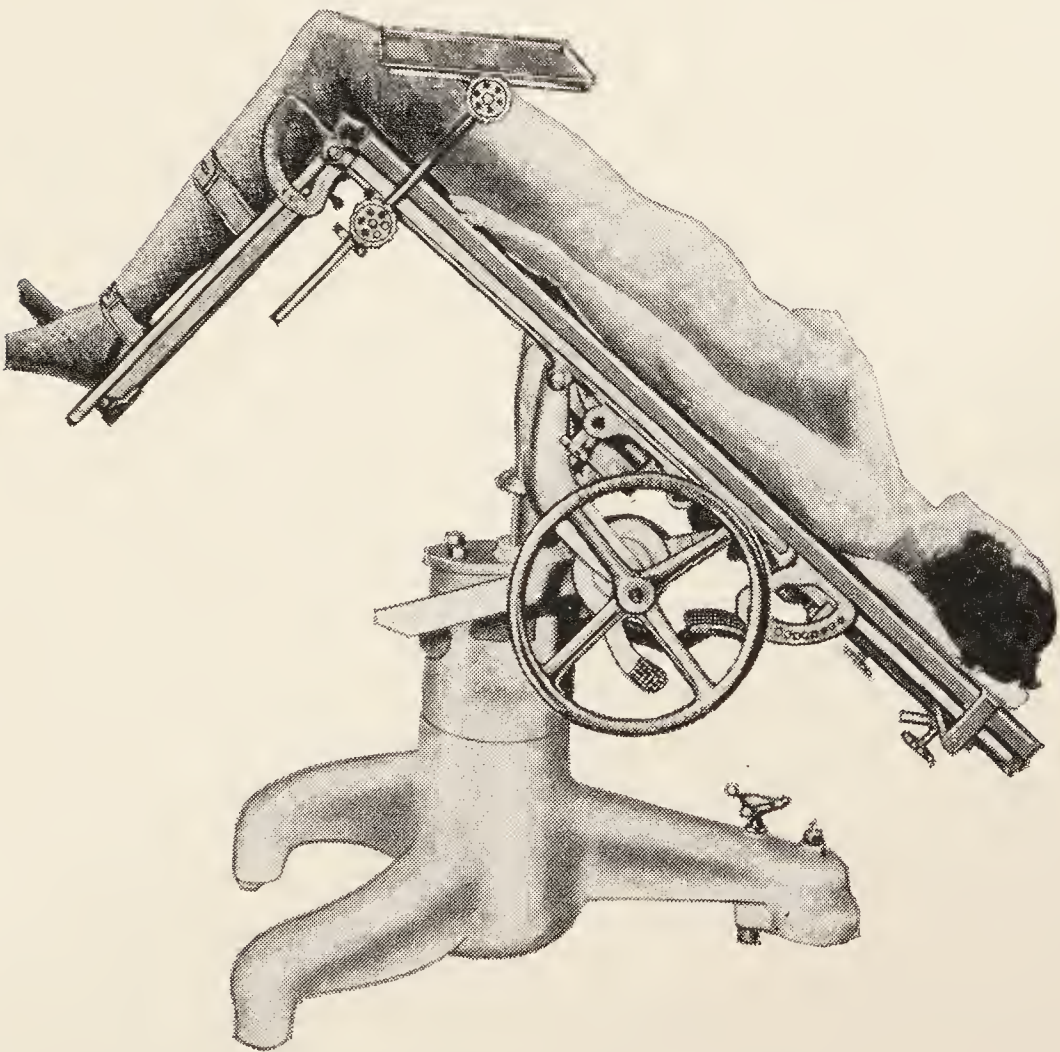


FIG. 38.—TRENDLENBURG POSITION.

To show the position more clearly the sterilized body-sheet has been omitted.

*(Allen & Hanburys' St. Bartholomew's operating table.)*



part of her body should be covered with the sheet only, which should be drawn down so that it just hides the pubic hairs.

Many nurses, when asked to get ready a patient for examination in the recumbent position, turn down the sheet, blankets, and bed-cover or quilt in one piece.

If the patient is not in bed she should remove her corsets and also her skirt, after which the strings of her petticoat should be loosened so that it can be pushed down together with her knickers, till the abdomen is bared, or if combinations are worn these should be unbuttoned or removed.

**Left Lateral Position.**—In the left lateral position the patient lies on her left side, her head on a pillow with her knees drawn well up towards her chin, and her back somewhat arched. Her buttocks should be lifted over the edge of the bed and the sheet should be arranged so that it can be drawn up easily so as to expose the vulva (Fig. 32). As a matter of experience one finds that very few nurses lift the buttocks of the patient over the edge of the bed, when placing her in the left lateral position. The patient is placed on the left side because most doctors are right-handed.

In this position the vulva can be well inspected, a bimanual examination can be made, pessaries can be inserted, and minor treatment to the vagina or cervix carried out.

**Semi-prone Position.**—The semi-prone position was invented by an American gynæcologist named Marion Sims, and is, therefore, often called after his name. On the patient assuming such a position, if the doctor separates the labia the air enters the vagina and distends the vaginal walls, and by this means, and with the aid of the duck-bill (Sims's) speculum, the vaginal walls and cervix can be efficiently examined (Fig. 33). It is also a good position for replacing an incarcerated retroverted gravid uterus.

The patient lies well over on her left side with her face and breasts on the pillow, her left arm hanging behind her over the edge of the bed or couch; while her pelvis and thighs are kept in the left lateral position, the right thigh being flexed somewhat more than the left.

**Knee-pectoral Position.**—This position causes the air, when the labia are separated, to enter the vagina and distend it to its greatest limits, in fact there results a pressure of fifteen

pounds to the square inch (that of the atmosphere) in the vagina. Advantage is taken of this pressure, and also of the fact that the viscera tend, in this position, to fall away from the pelvis, when endeavouring to replace an incarcerated retroverted gravid uterus, or a tumour impacted in the pelvis but, since these complications are of infrequent occurrence, the nurse will not often be asked to place the patient in this position.

The patient is placed so that she kneels on the bed or couch, her thighs being in a vertical position and her feet projecting over the edge of the couch. At the same time her breasts rest on a pillow, and her face is turned to one side (Fig. 34).

**Dorsal Position.**—In this position the patient lies in the recumbent position with her knees well drawn up and separated. Some doctors prefer to make a bimanual examination with the patient in this position. The doctor stands either at the right side of the patient, or if the patient is placed across the bed or brought to the end of the couch with the buttocks overhanging, then he stands between her legs.

In this latter case the legs must be held or may be placed on two chairs, or on extension brackets if the couch is fitted with these. The patient's head and shoulders should rest on a pillow, her nightgown must be drawn up under her buttocks, and her knees should be covered with a sheet or shawl (Fig. 37). The advantage of this position is that an examination can be made with the pelvic organs more or less in their natural position and, if the doctor stands in the second position indicated, a very complete examination can be made of the vulva, while treatment to the vagina or cervix can be easily applied. This is also the best position for passing the catheter, in which case the sheet should be drawn up above the pubes.

One of the most useful positions for the bimanual examination, and one which does not expose the patient to such an extent as that last described, is for the patient to lie with the upper half of her body in the recumbent position and with her pelvis and thighs in the left lateral position, or as near to this as she is able.

### For Minor and Major Operations.

**Recumbent Position.**—In this position the patient lies flat on the operating table ; it is used when the Trendelenburg position is not required.

**Lithotomy Position.**—In this position the patient is placed in the dorsal position, and her buttocks are drawn well over the end of the table. The thighs are then flexed on the trunk and the legs on the thighs. If the patient is kept in this position by means of a Clover's crutch, the nurse must remember that *the cross-bar is strapped to the legs below the knee, and not to the thighs above the knee and that the strap goes over one shoulder and under the other.* It does not matter how experienced a nurse may be, she may have even been a Theatre Sister, but, in most cases, when she takes up private nursing she will invariably apply this cross-bar incorrectly. If an operating table is being used it will have uprights at its end to which the *ankles should be strapped and not the knees*, which will obviate the necessity of using a Clover's crutch (Fig. 35). A common mistake for the nurse to make is not to draw the buttocks of the patient far enough over the edge of the table.

**Trendelenburg Position.**—The Trendelenburg position, named after the surgeon who suggested it, is the position in which the patient is most often placed for an abdominal operation on the pelvic organs. The patient is so tilted that her knees are the highest point and her head is the lowest. This position to be perfect requires an operating table that is made to tilt especially for this purpose. *While the patient is being tilted into this position, a nurse must press the feet back so that the legs are at right angles to the thighs*, otherwise the patient will slip down the table, perhaps on to the lap of the anæsthetist. This apparently small point is of more importance than most nurses working in private, or in Nursing Homes, appear to think, for the patient having slipped down, the table has to be lowered and the whole process repeated ; a waste of time, energy, and most irritating to the surgeon. When the requisite tilt has been obtained, the ankles are secured to the frame of the table with bandages. The best operating tables have movable end-pieces to which the ankles can be secured before the table is tilted so that the legs need not be held at right



angles. If such a table is not available a modified Trendelenburg may be obtained by resting the back of the patient against a chair turned upside down, allowing her legs to hang over the rail below the seat. The great advantage of the Trendelenburg position is that the intestines and omentum fall back towards the diaphragm, leaving the pelvis free and exposing the pelvic organs (Fig. 38).

### After Operation.

**Minor Operations.**—After a minor operation the exact position of the patient in bed does not in most cases signify, though after perineorrhaphy the patient will be more comfortable on her side owing to the swelling and tenderness at the site of the operation, unless a ring air cushion is available.

**Major Operations.**—When the patient is first returned to bed she should be placed upon her back, her legs should be raised, and her knees kept flexed by means of a pillow placed under them. In this way strain on the abdominal muscles is prevented. A pillow should also be placed under the small of the back which needs support.

After the shock of the operation has subsided the patient, if she wishes, may be turned on her side and kept in that position by pillows placed under her shoulder and legs.

**Fowler's Position.**—In this position the patient is propped up in a sitting posture by means of a bed-rest or pillows. To keep her from slipping down into the bed a bolster rolled in a draw-sheet with long ends is placed under her knees. To keep this bolster in position, bandages are tied to the long ends of the draw-sheet and to the head of the bed on each side. When this is not necessary, owing to the bed having an adjustable bed-rest, the ends of the sheet are securely tucked under the mattress at each side. If the patient is heavy and the bolster tends to buckle up, a broom-stick wrapped round with a blanket and draw-sheet will be found a most efficient substitute (Fig. 39).

Fowler's position is the very best for the patient to assume after an abdominal operation. It relieves the backache, diminishes the tendency to flatulence and sickness, and encourages sleep and drainage from the vagina.





FIG. 39.—FOWLER'S POSITION.

If abdominal drainage has been employed this position also allows the fluid to escape more easily through the tubes.

**After Spinal Anæsthesia.**—The patient is returned to the ward on the ambulance in a modified Trendelenburg position by means of a wooden apparatus. After the patient has been returned to her bed, the front legs of the bed are rested on the seats of two chairs for four hours. For the next four hours the front legs are rested on blocks 12 inches high, for the next four hours on blocks 6 inches high, after which the bed is placed in its usual position and two pillows are put under the head of the patient. By precautions such as these it is found that the very severe headache, which may last for days after spinal injection, is practically abolished.

If the patient is very anæmic she must be kept quiet and must not be allowed to exert herself in any way.



## CHAPTER XXVII.

### VAGINAL DOUCHING AND TAMPONADING—CATHETERIZATION—WASHING OUT THE BLADDER.

#### VAGINAL DOUCHING.

VAGINAL douching, unless employed in suitable cases, does more harm than good. The normal secretion of the vagina is acid in reaction and it has a deleterious effect on most septic and pathogenic organisms.

Nature never intended the vagina to be douched, and to wash away its secretion only encourages the growth of microbes, more especially if the solution used is an alkaline one. Moreover, as vaginal douching causes a certain amount of congestion, if persisted in for any length of time, it increases the secretion of the genital organs, tends to make the period more profuse and is, in some cases, the cause of dysmenorrhœa and pelvic pain. It is a matter of everyday observation that so long as a woman continues to use a vaginal douche, her leucorrhœa persists.

Vaginal douching is most commonly used by women for leucorrhœa, and this without the advice of a doctor. When it is remembered that in most cases of leucorrhœa the discharge comes from the lining membrane of the uterus, and that the solution used in a vaginal douche cannot possibly get into the uterus, unless the cervix is dilated, it is manifest that the only result of vaginal douching, apart from any harm it may do, is in most cases to wash away the discharge that has collected in the vagina. The amount of leucorrhœa will undoubtedly appear to the woman to be less, but the other symptoms she often complains of may rather tend to get worse.

It is not the custom of most operators, nowadays, to order

vaginal douching after the operations of anterior and posterior colporrhaphy or of perineorrhaphy. The cases are found to do better if treated by the "dry method." It sometimes happens, that in spite of every precaution, a certain amount of infection takes place in the wound accompanied by an offensive vaginal discharge. In these circumstances the surgeon may order antiseptic douches. In this case the nurse should use a piece of rubber tubing for the douche nozzle—a full size rubber catheter will do very well. If the glass or vulcanite douche nozzle is used there is a very real danger of the nurse forcing the end of the nozzle between the sutured edges of the wound, and so seriously interfering with the success of the operation. This accident has often happened.

Vaginal douching may also do harm in other ways. For instance, if a woman has a gonorrhœal infection of her vulva, a vaginal douche may be the means of conveying the gonococcus to the vagina or uterus and so to the Fallopian tubes, ovaries, and peritoneum. Again, after the uterus has been curetted, vaginal douching may lead to its infection, and this is perhaps why the result of this operation is so often disappointing.

Vaginal douching, however, is definitely indicated in certain cases. Thus the septic condition of the vagina and the offensive discharge associated with cancer, sloughing fibroid polypi, or sloughing of the vagina or cervix after operations or childbirth, will necessitate antiseptic and deodorant douches.

Uterine and vaginal hæmorrhage is rightly treated with hot vaginal douches, but the douche must be hot and not warm. Pelvic inflammation, such as pelvic peritonitis and pelvic cellulitis, can in many cases with advantage be treated by hot douches. If a patient is wearing a pessary she should give herself a vaginal wash out once a day for cleansing purposes.

### **The Administration of Vaginal Douches.**

The following articles are required : a douche-can, a douche-pan, a bath thermometer, and a measure.

The douche-can should hold 2 quarts, should have 6 feet

of tubing attached to it, a glass nozzle, and a tap near the nozzle so that the patient can, if she likes, stop the flow.

As a rule only 2 quarts of fluid are used at a time, which take about five minutes to run through, and the douche-pan should hold this quantity. If, however, for some reason the doctor wishes the patient to be douched longer, say for fifteen or twenty minutes, then, in addition, a pail will be required to empty the contents of the douche-pan into, or a douche-pan may be obtained to which is affixed a piece of rubber tubing, the free end of which on being put into the pail carries the douche from the douche-pan into the pail, without the patient having to be disturbed.

The temperature generally employed for aseptic purposes is  $110^{\circ}$  F., and that for bleeding or inflammation is  $115^{\circ}$  F. to  $120^{\circ}$  F. Most patients can stand a temperature of  $106^{\circ}$  F. to  $110^{\circ}$  F., but when the temperature rises above this and the douche runs for any length of time some distress may be caused by the fluid, as it escapes into the douche-pan, burning the inner surfaces of the thighs. This can be greatly modified by smearing with vaseline the parts involved.

In the preparation of these douches the nurse must be most careful *that the antiseptic to be added to the water is of the strength ordered and the temperature of the solution the correct height*. A nurse may sometimes be seen to pour in the antiseptic without having the least idea of what the real strength of the douche will be, while to gauge the temperature she will make a rough guess by inserting her fingers into the fluid.

Nurses should remember that it is quite easy to poison or scald a patient with a vaginal douche, the solution of which has been improperly prepared.

The solution should always, therefore, be mixed in a separate jug, and its temperature tested before it is emptied into the douche-can. All the appliances for douching should be rendered as aseptic as possible by a thorough washing and boiling. If there is no utensil large enough in which to boil the douche-can, it must be swabbed with carbolic acid (1 in 20). The glass nozzle during the interval of its use should be kept in a solution of carbolic acid (1 in 20).

**Douching on the Back.**—All pillows should be removed



in order that the pelvis may be suitably tilted, and the patient should lie flat on her back, with her legs drawn up and separated, her pelvis resting on the douche-pan which has been warmed. A macintosh is placed under the douche-pan, and the bed-clothes are drawn up. The nurse having placed the douche-can in a convenient place and raised above the level of the patient, then thoroughly washes her hands, cleans the vulva with biniodide of mercury (1 in 2000), lysol or monsol (1 in 160), and again making her hands as aseptic as possible introduces the nozzle by separating the labia with her left fingers and pushing the nozzle into the vagina with her right hand. The tap is then turned and the douche flows into the vagina and out again into the douche-pan.

**Douching on the Side.**—The patient is placed in the left lateral position with her buttocks drawn over the edge of the bed, the knees well flexed, the right beyond the left, and both raised at an angle from the bed by a pillow which slopes to the lower hip. A thick pad must be placed between the thighs, the upper end against the pubes to prevent a backward flow of fluid along the groin. The bed-clothing should be sufficiently folded back to leave exposed the necessary parts—vulva and outer border of the buttocks.

A warmed macintosh with a rolled-in border, to form a ridge of protection, is placed under the hip, so that it slightly lodges on the end of the knee pillow and is well grouped over the edge of the bed to form a gutter into a pail which has been placed on the floor beneath the buttocks. Sterile towels can then be arranged round the parts as desired.

A copious douche can thus be given without disturbing the patient, or in any way soiling the bed, and the parts are clearly available for such treatment as plugging the vagina. The patient should be dried thoroughly after the douche.

### Packing the Vagina.

Vaginal tampons are prescribed for inflammatory conditions of the vagina, uterus, ovaries, Fallopian tubes, pelvic peritoneum, and pelvic cellular tissue, or as a means of controlling hæmorrhage from the uterus or vagina.

**For Inflammatory Conditions.**—A vaginal douche should be given both before the tampons are inserted and

after they are removed, the vagina being dried very carefully with swabs, and any discharge that may still be clinging to its walls removed, in order that the drug with which the tampon is impregnated may be brought into contact with the inner surface of the vagina.

One method of making a tampon is to take a piece of absorbent wool 12 inches long and 5 inches broad, and to sew a piece of tape to one end. The solution of the drug which has been prescribed is poured over this strip of wool and allowed to soak thoroughly into it, the wool is then twisted up like a rope and is ready for use.

Another method is to make several small tampons about the size and shape of a hen's egg, or perhaps a little smaller, to which are attached pieces of silk or tape by which they can be removed.

When using tampons it is most important to see that the whole vagina is carefully packed and everywhere in contact with them.

*Before the nurse inserts the tampons the patient should empty her bladder, or the urine should be drawn off by catheter.* Especially is this of importance when the vagina is being plugged for hæmorrhage, in which case the tampons must be packed as tightly as possible, and if this is done efficiently the urethra will be compressed and so prevent micturition. Since the plugging must be left in the vagina for several hours, if then the bladder contains a fair quantity of urine when the plugging is inserted, the latter will have to be removed sooner than is desirable, in order that the patient may empty her bladder.

Tampons may be introduced either by means of a Sims's speculum and swab-forceps or by placing the first and second fingers of the left hand in the vagina, separating the labia a little, and then inserting the tampon with the right hand. The fingers of the left hand are then withdrawn, and the tampon pushed up as far as possible with the first finger of the right hand. The tampons should always be carefully and firmly packed round the cervix, gradually filling up the vagina from above downward. The tampon is, as a rule, inserted at night, and removed in the morning, and as the secretion caused by its use is often rather profuse, a diaper should be worn.

Medicated tampons are best passed through a Ferguson's speculum with swab-forceps.

Medicated tampons can easily be introduced into the vagina by a nurse who has been properly trained.

**For Hæmorrhage.**—In the case of hæmorrhage from the uterus or vagina a douche at 120° F. should first be given, and flavine 1 in 1000 is frequently used for this purpose since its action is styptic as well as antiseptic. Medicated gauze or plain gauze dipped in biniodide of mercury (1 in 4000), lysol or monsol (1 in 320) may then be packed into the vagina supposing tampons are not handy. If gauze is not obtainable it is best to use what is known as a kite-tail tampon. This is made by tying a number of pieces of cotton-wool about the size of hens' eggs to a tape, so that there shall be 4 inches of tape between each piece of wool, and this should be wrung out in an antiseptic solution.

The patient must be in the dorsal position lying across the bed, and the vagina has to be packed as tightly as possible. Apart from any restlessness of the patient, the operation is a very difficult one for any nurse however skilled. Since this method of arresting bleeding from the genital passage is used only in an emergency, the nurse will have sent for the doctor and must do her best till he arrives.

### Catheterizing the Bladder.

Although one of the simplest procedures, catheterization may, if carelessly performed, cause the patient many weeks of misery, and perhaps kill her, the great danger being that bacteria may be introduced into the bladder. If this happens cystitis is set up, and the inflammation may then extend up the ureters to the kidneys and kill the patient, or infecting one kidney so disorganize it that its removal is imperative.

To prevent, therefore, bacteria being carried into the bladder, the nurse must thoroughly wash and scrub her hands, and then dip them into a solution of biniodide of mercury (1 in 2000), lysol or monsol (1 in 160); she must be sure that the catheter is sterile and, lastly, that the vulva is clean.

In some cases, owing to inflammation of the urethra, a malignant growth, or urethral caruncle, the patient may



experience acute pain when the catheter is passed. To relieve the pain the doctor may order a few drops of a 10 per cent. solution of cocaine to be injected into the orifice of the urethra with a glass syringe.

The best catheter to use is a glass one ; if it is impossible to use this on account of some tumour pressing on the urethra, then a soft rubber catheter should be used. In either case the catheter should be well boiled before and after use, and in the interval it should be kept in carbolic acid (1 in 20). Special care must be taken with the soft rubber catheter to see that the eye is quite patent, and in both a stream of water should be passed through after use in order that the channel may be properly sluiced.

A pathological condition of the urethra being absent, pain, as opposed to discomfort, should not be experienced by the patient when the catheter is passed. In such circumstances pain means that the catheter is being passed roughly or in a wrong direction. Especially may there be some little difficulty in passing the catheter after the operation of anterior colporrhaphy, when the direction of the urethra may be somewhat altered. In such cases, in their endeavour to force the catheter into the bladder and when using a hard catheter, nurses have punctured the floor of the urethra. The result has been a urethro-vaginal fistula, a most difficult injury to cure by operation and leading to great misery of the patient. For this reason it is better, after the operation of anterior colporrhaphy, for the nurse to use a rubber catheter if the patient is unable to micturate.

The nurse having made her hands as aseptic as possible, the vulva is cleaned as follows : The patient being on her back with her legs drawn up and separated, the labia are held apart by the first and second fingers of the left hand, the wrist resting on the pubes, and the vestibule, containing the orifice of the urethra, exposed. The vestibule is well swabbed with biniodide of mercury (1 in 2000), lysol or monsol (1 in 160), by which means any bacteria contaminating this area may be removed and the risk of their being carried in by the catheter excluded. The nurse again surgically cleanses her hands and, exposing the vestibule once more with her fingers, passes the catheter into the urethral orifice with her right hand.

A porringer should be placed between the patient's legs to receive the urine, and the catheter should be held in position with the labia separated until most of the urine has passed. On the stream of urine diminishing and the fluid escaping in drops, the catheter is pulled out a little till the stream recommences to flow. When a second time the drops appear the bladder is practically empty, and the catheter is withdrawn. The thumb should be kept over the orifice at the free end so that any urine remaining in the catheter will not be spilt over the patient or bed-clothes, and it can then be added to the rest of the urine in case there is any sediment ; or the contents of the catheter can be added to a sterile test-tube if the doctor so desires.

The difficulties that may arise when passing a catheter are due to the fact that after a prolonged, or otherwise abnormal, labour the orifice of the urethra is sometimes difficult to find because the parts adjacent to it are swollen ; to some tumour preventing the passage of the catheter, or, much more commonly to the nurse, especially if she be inexperienced, failing to recognize the orifice of the urethra and passing the catheter into the vagina. If this happens, it need hardly be said that the catheter should again be sterilized before being used, or a better plan is to prepare two catheters in the first place so that if one is soiled the other is ready for use. To prevent the catheter being passed into the vagina it is a good plan, especially when probationers are first learning to pass a catheter, to place a swab in the vaginal orifice before the instrument is passed. If the catheter has been used for a septic case it is much safer not to use it for any other.

Nurses should learn thoroughly the position of the urethral orifice, which may be difficult to detect if the parts are swollen.

It occasionally happens that when the abdomen has been opened the bladder is found to contain so much urine that it gets in the way of the gynæcologist as he is starting to remove the uterus. The reason the bladder is thus distended may be that the nurse did not draw off all the urine, that the patient was left waiting for the operation longer than usual after her bladder had been emptied, or that owing to the position of the tumour, for instance a cervical fibroid, the nurse could not pass the catheter so easily as she is accustomed to. In the

latter circumstance, it is the duty of the nurse to inform the operator of her difficulty. In fact, most careful gynæcologists before commencing the operation will ask the nurse in every case, whether there has been any difficulty in drawing off the urine. The reason for such a question is that if the operator is ignorant of the fact that the bladder may be distended, he can very easily cut into it when opening the peritoneal cavity. The nurse also would do well to remember that, if the bladder is found to be distended when the abdomen has been opened, she may be called upon to pass the catheter. Nothing is more pathetic than to see a nurse, whose job it really is to pass catheters on females when necessary, fail ignominiously, because the patient may not be in the exact position in which the nurse has generally passed the catheter, or because the nurse is ignorant of the relations of the urethral orifice.

### **Washing Out the Bladder.**

The following articles are required for washing out the bladder : A glass funnel to which is attached 4 feet of india-rubber tubing, a glass catheter with a small piece of rubber tubing, and a glass joint to which can be attached the tube and funnel. A kidney tray to receive the urine, a porringer for receiving the return flow from the bladder, and a jug and thermometer for the solution. The apparatus should be sterilized, and then placed ready on a table by the side of the patient.

Before washing out the bladder its capacity should be gauged.

**Method of Gauging the Capacity of the Bladder.**—After the catheter has been passed, with the precautions already noted and the urine evacuated, the catheter should be withdrawn and another catheter with the tubing and glass funnel attached, which have been filled with sterile lotion to exclude air, is then inserted. This method is much more comfortable for the patient than attaching the tubing to the first catheter inserted since, unless the nurse is very expert and careful, the catheter will be moved unduly while the tubing is being affixed. The tubing is pinched below the funnel which is then emptied, after which the funnel is filled with the



prescribed lotion and the fingers are removed from the tube. The solution is poured in slowly till it begins to rise back in the funnel, showing the bladder is full. The tubing is at once pinched, the funnel lowered into a measured porringer, and the tubing unpinched, when the contents of the bladder will siphon out giving the capacity of the bladder.

**To Wash Out the Bladder.**—A solution of boric acid

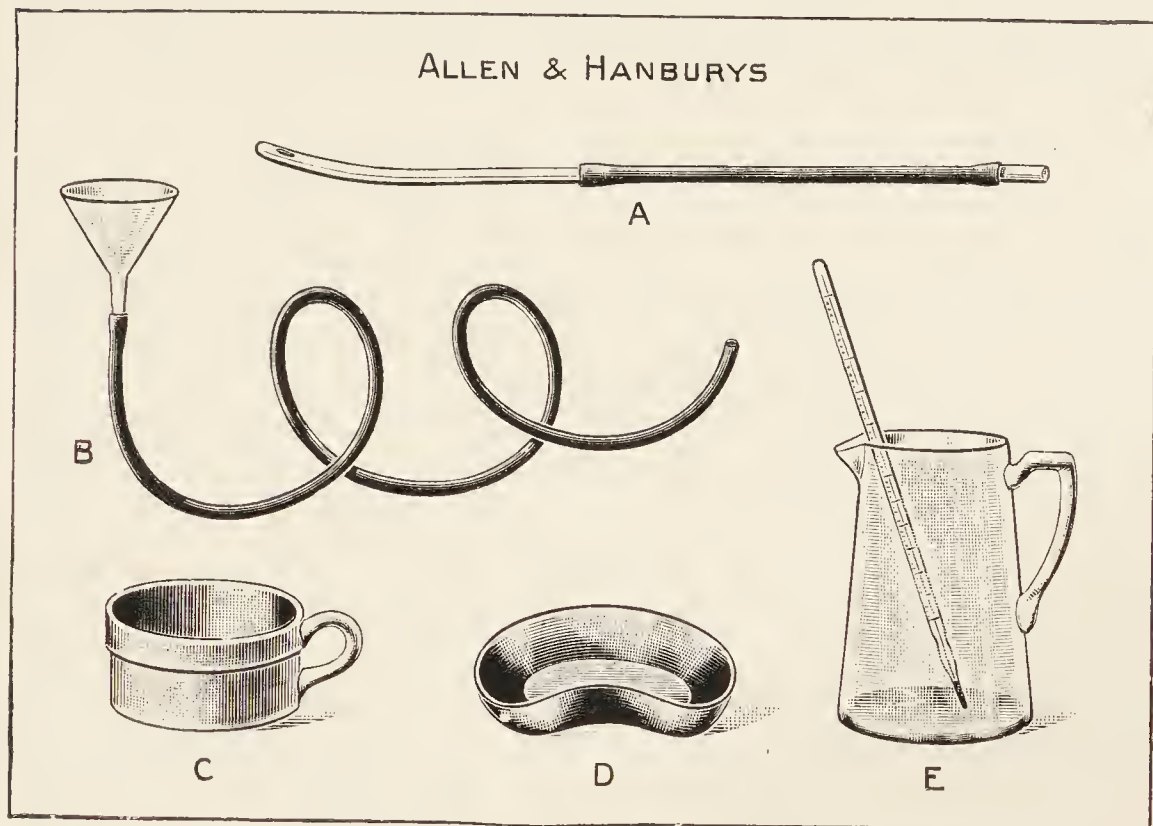


FIG. 40.—ARTICLES FOR WASHING OUT THE BLADDER.

- A. Glass catheter, rubber tubing and glass joint.
- B. Glass funnel and rubber tubing.
- C. Porringer for swabs.
- D. Kidney tray, urine.
- E. Glass or enamel measure and thermometer.

(1 in 20), or other prescribed solution, having been previously prepared, the bladder should be washed out with repeated amounts one ounce less in quantity than the proved capacity of the bladder. After the solution has remained in the bladder a short time the funnel is lowered and the solution allowed to run out. This is repeated until at least 2 pints of the solution have been used, the bladder being washed out

twice daily until the cystitis is relieved. The temperature of the solution to be used should be between  $100^{\circ}$  F. and  $105^{\circ}$  F. The nurse must be most careful to ensure that the temperature of the solution is not above  $105^{\circ}$  F. It has happened that a nurse, carelessly ignoring this point, has used a solution so hot that the bladder has been terribly scalded, resulting in vesico-vaginal and recto-vaginal fistulæ, incontinence, and invalidism for many months and most serious operations in an endeavour to cure the injuries.

## CHAPTER XXVIII.

### SALINE INFUSIONS—BLOOD TRANSFUSION— NOVARSENOBILLON INTRAVENOUS INJECTION.

#### SALINE INFUSION.

**Intravenous.**—An intravenous saline infusion is often wanted in an emergency, and it is important, therefore, for the nurse to know what articles are required, since, in the circumstances in which such a method of treatment is required, the doctor will be attending to the patient in other ways and will not have any time to superintend the preparations the nurse will be called upon to make.

An intravenous saline infusion is generally used when there has been a severe and rapid loss of blood, and it is necessary to make up the amount of fluid lost as quickly as possible. Such conditions, therefore, as post-partum hæmorrhage, intraperitoneal bleeding due to a ruptured tubal gestation, severe loss of blood during an operation or as the result of an injury, all call for this method of treatment in the absence of blood transfusion.

Saline infusion is also used in cases of severe vomiting, septicæmia, and uræmia.

The transfusion apparatus consists of a receptacle for the salt solution, an india-rubber tube, one end of which is attached to the receptacle and the other end to a cannula which is slipped into the vein when it is opened.

A proper transfusion apparatus may not be available, in which case if the doctor has got a cannula, an irrigating porringer will suffice.

Normal saline solution is made by adding a teaspoonful of common salt to a pint of water and boiling the mixture. Some surgeons require glucose 2 per cent., to be added to



the mixture in cases of subcutaneous injection. It should be kept at a temperature of  $105^{\circ}$  F. in the receptacle so that it will be the correct temperature,  $100^{\circ}$  F., when it flows into the vein.

The following articles must be procured and when necessary sterilized by the most appropriate method, and then assembled on a table covered with sterilized towels, or on a sterilized tray :—

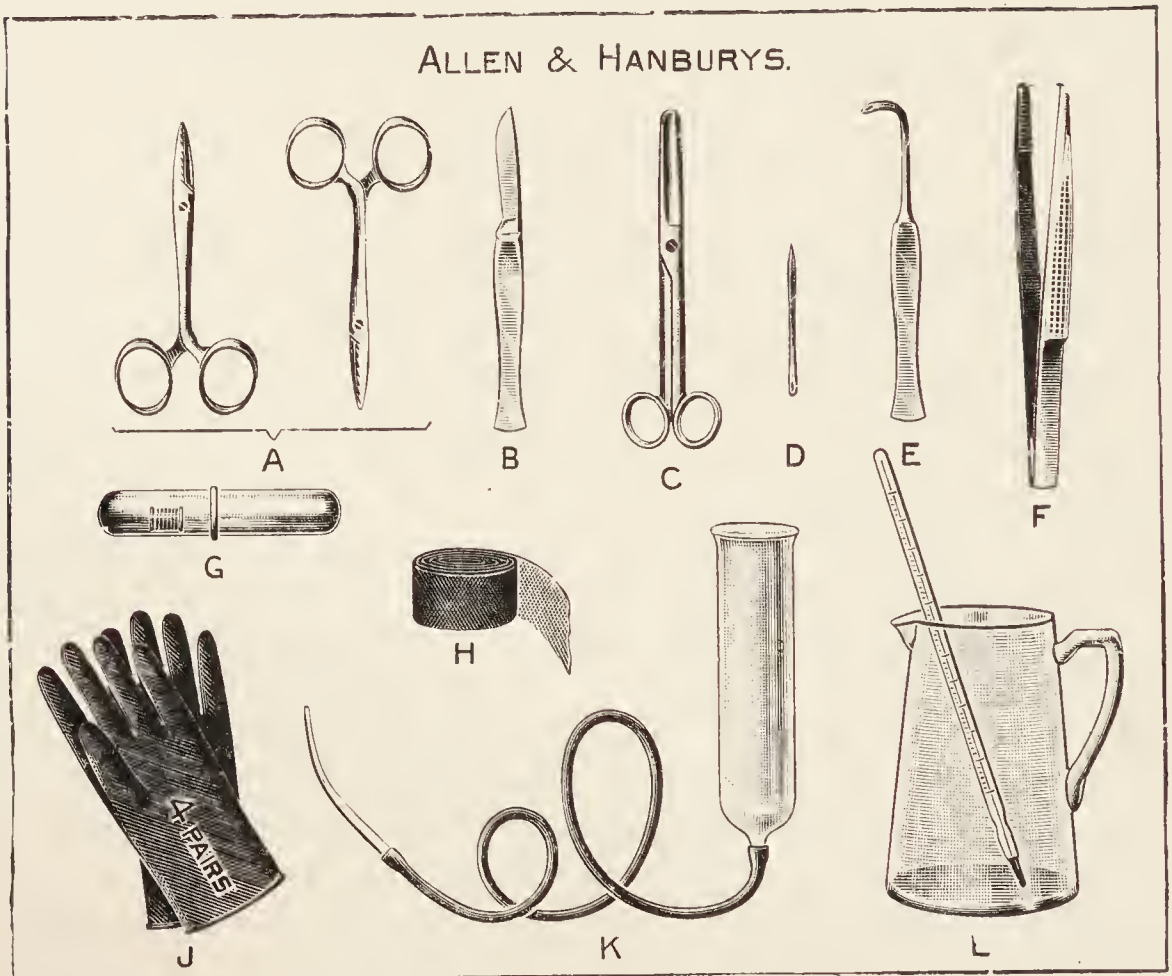


FIG. 41.—ARTICLES FOR INTRAVENOUS SALINE INFUSION.

- A. Two pairs of pressure forceps.
- B. A scalpel.
- C. Scissors.
- D. A suture needle.
- E. An aneurysm needle.
- F. Dissecting forceps.
- G. Catgut, ligatures No. 2.
- H. A bandage to constrict the upper arm.
- J. Gloves.
- K. The transfusion apparatus.
- L. A measure and a thermometer.

Sterilized swabs. Iodine solution. Saline solution.

**Subcutaneous Saline Infusion.**—By this method the saline solution is introduced into the cellular tissue of the body and from thence is absorbed into the blood.

It takes longer for the amount of saline solution required to enter the cellular tissue than it does for the solution to enter a vein, and the solution in the receptacle should therefore be hotter. The temperature of the solution as it is introduced should be  $105^{\circ}$  F.

The solution may be run in under the breasts or into the thighs, other situations sometimes chosen are the axillæ and flanks.

The following articles must be procured and, when necessary, sterilized :—

Iodine solution.

A measure containing normal saline solution.

A glass funnel to which is attached 4 feet of india-rubber tubing.

An aspirating needle.

A thermometer.

Collodion and gauze for sealing the puncture after the needle is withdrawn.

If the nurse is directed to give the infusion, she must remember that while she is introducing the aspirating needle she should let a little of the solution escape. About a pint can, as a rule, be run into the cellular tissue without causing any undue distress to the patient from the distension of the cellular tissue. After this amount is absorbed a further quantity may be introduced.

**Continuous Subcutaneous Saline Infusion.**—This method of treatment is used in cases of shock and of peritonitis and in other diseases of a septic nature. It is particularly useful when the administration of fluid by the mouth, or rectum, is impossible, and it is necessary to introduce large quantities of solution. By this means from 10-20 pints may be introduced in the 24 hours, according to the absorbing powers of the patient. It is not advisable to allow the fluid to enter quicker than 10 ounces an hour, owing to the discomfort resulting. Unless a proper instrument is available this is rather a troublesome method to carry out, owing to

the difficulty of keeping the temperature of the solution uniform, and of regulating the rate of the flow.

The most convenient and best apparatus is a modification of a vacuum flask invented by Souttar, which keeps the solution at a uniform temperature, and requires but very little attention. The saline solution is run in by siphon action from the receptacle through an india-rubber tube to which is attached one or two aspirating needles, according to the pattern

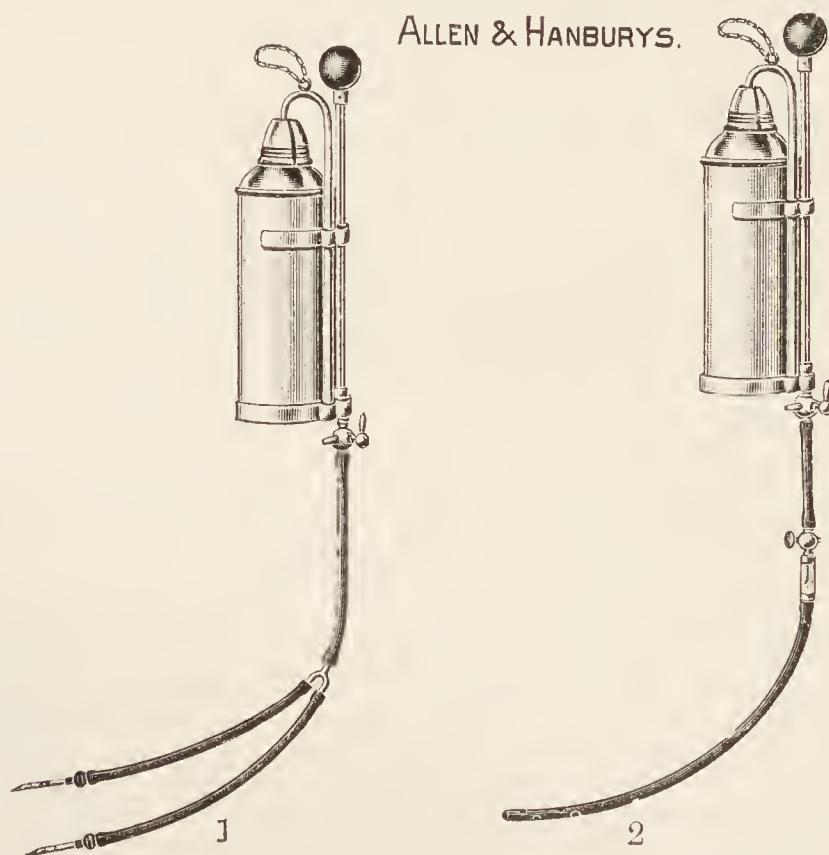


FIG. 42.—SOUTTAR'S "THERMOS" SALINE INFUSION APPARATUS.

1. For subcutaneous infusion.
2. For continuous rectal infusion.

of the apparatus used. The needles should be retained in position by strips of adhesive plaster, and the exposed part of the body should be covered with wool pads to prevent the patient getting chilled. The rate of flow is regulated by the tap and observed on the gauge.

The great advantage in the use of this apparatus is the large quantity of saline that can be absorbed. Owing to its constant high temperature the saline is taken up at once



into the vessels. There is rarely any swelling of the tissues and the renal excretion is increased.

In the absence of a vacuum flask, the temperature of the solution can be kept more or less uniform if an electric bulb, having been lighted, is tied to the side of the receptacle. If electricity is not available, then the receptacle containing the saline solution must itself stand in a larger receptacle surrounded by water at a much higher temperature, so that the saline solution as it is introduced should be at a temperature of  $105^{\circ}$  F.

**Intraperitoneal Infusion.**—At the conclusion of an abdominal operation some surgeons, before completely closing the wound in the parieties, pour into the peritoneal cavity two or more pints of saline solution. This is done more especially after the radical operation for cancer of the cervix.

The following articles will be required, and must be sterilized :—

ALLEN & HANBURY'S

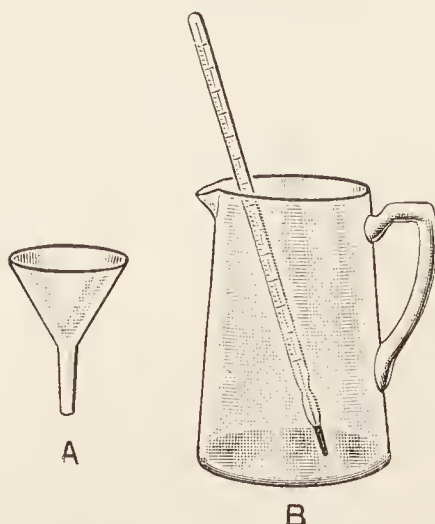


FIG. 43.—ARTICLES FOR INTRAPERITONEAL INFUSION.

A. Glass funnel.

B. Glass measure and thermometer.

The solution in the jug should be at a temperature of  $105^{\circ}$  F.

## BLOOD TRANSFUSION.

Blood transfusion is employed when a patient has lost a large amount of blood during an operation, or as the result of secondary hæmorrhage. It is also used for very anæmic patients before an operation, for surgical shock, and in cases of septicæmia. It has the advantage over intravenous saline injection in that it lasts longer, the fluid is serum instead of water and, in addition, blood-corpuscles are introduced into the circulation.

**Rationale of Blood Transfusion.**—People can be divided into four groups according to the action of the serum of their blood on the red blood-corpuscles of others.

The blood-serum of the one may cause the red blood-corpuscles of the other to aggregate, but no such action will result if both are of the same group. If the blood of a donor is transfused into the circulation of a patient and the red corpuscles of the donor's blood aggregate, the result will be innumerable microscopical emboli in the blood of the patient, sometimes leading to death, or subsequently the red corpuscles may hæmolyze when the patient will be jaundiced. If the red corpuscles of the donor do not aggregate, then his blood may be used. The emboli reach the kidneys, causing suppression of urine, or partial suppression with hæmaturia.

From this it is obvious that the serum of the patient should not belong to a group which will cause destruction of the red blood-corpuscles of the donor.

*How to Ascertain to which Group a Person Belongs.*—The four groups, into one or other of which every person can be included, are numbered as follows :—

Group I. Known as the Universal recipient. People in this group can receive, without danger, blood from any man or woman, but can give their blood, without danger, only to men, women, and children of their own group.

Group II.

Group III.

Group IV. Known as the Universal donor. People in this group can give, without danger, blood to any man, woman, and child, but can receive blood, without danger, only from men or women of their own group.

To ascertain to which group the patient belongs, some serum from a person who is known to belong to Group II and some serum from a person who is known to belong to Group III is spread each on a separate slide. With each serum is mixed a drop of blood from the patient it is wished to group. One or other of the following results will then occur:—

If the patient belongs to Group I clumping will occur in the serum from the person known to be a Group II or Group III.

If the patient belongs to Group II clumping will occur in the serum from the person known to be a Group III.

If the patient belongs to Group III clumping will occur in the serum from the person known to be a Group II.

If the patient belongs to Group IV there will not be any clumping.

Clumping is the term used for the aggregated red blood-corpuscles, which can be seen on the slide with the naked eye.

Patients in Group I can receive blood from donors in Groups I, II, III, IV.

Patients in Group II can receive blood only from donors in Groups II, IV.

Patients in Group III can receive blood only from donors in Groups III, IV.

Patients in Group IV can receive blood only from a donor in Group IV.

Although, for practical purposes, this table is about correct, and can be used in cases of emergency, it is not absolutely safe to use it, and whenever possible the donor should belong to the same group as the patient.

*How to Choose a Donor.*—There are two methods of procuring a suitable donor, the scientific and the empirical.

*Scientific.*—

1. Ascertain the group number of the patient.
2. Procure a suitable donor of the same group.
3. Test the blood of this donor against the serum of the patient.<sup>1</sup>

<sup>1</sup> Since it is now known that there are sub-groups in each group, this additional caution should be taken.



There is now in most large towns a list drawn up by the Red Cross Society, or the hospital, divided into these four groups, of people (donors) who are willing to give the required amount of blood. If, therefore, a patient requires a blood transfusion, his or her group having been ascertained, a suitable donor can be obtained in accordance with the above list.

*Empirical.*—If such a list, or a donor whose group is known, is not available, then the serum of the patient, whether his or her group number is known or not, must be tested against a drop of blood from any person who has volunteered to be a donor. If the red blood-corpuscles of the volunteer donor clump, the blood of other volunteers must be tested until one is obtained the red blood-corpuscles of whom do not clump, which signifies that a suitable donor has been found.

The empirical method is often followed, one or more members of a patient's family volunteering to be donors because the services of a grouped donor is not available.

The most simple, and quite satisfactory, method of blood transfusion is that with citrated blood. This method has the following advantages, apart from its simplicity:—

1. The blood is obtained without damage to the donor, which is not the case with the paraffin method, which necessitates dissecting out a vein in the donor.

2. The blood can be kept for some hours without fear of its clotting, provided it is well mixed with the citrate solution.

### **Preparation of Instruments and Apparatus.—**

The jug, flask, and tubing are sterilized by boiling and also the instruments. Two tables are required, each covered with a sterile towel. On one table are placed the jug, French's needles, one tourniquet, and the hypodermic syringe and needle. Upon the other table are arranged the instruments for dissecting out the vein in the recipient, the flask, tubing and cannula and the swabs. On a third table, close at hand, are placed the dressing tins, gloves, and gowns, and the bottles containing the novocaine and the citrate solution.

The nurse should be ready to pour out the novocaine and citrate solution.

### Method of Transfusion of Citrated Blood.—

The donor should be lying down with his arm resting on a macintosh sheet covered with a sterilized towel, and comfortably supported near the edge of the table or bed. The region of the bend of the elbow is then sterilized with methylated spirit. Iodine or picric acid should not be used on account of the risk of a rash resulting. A wheal is then raised in the skin over the region of the vein by injection of novocaine and a tourniquet is applied to the arm.

The sodium citrate solution is now poured into the jug in sufficient amount so that when all the blood required has been drawn off, there shall not be less than 1 c.c. of a 3·8 per cent. sodium citrate solution to every 10 c.c. of blood. If less than this be added there is a risk of the blood clotting.

A French's needle is next thrust into the vein and the blood which squirts out collected in the jug, which is gently shaken all the time to ensure thorough mixing with the citrate solution.

When the requisite amount of blood has been collected the tourniquet is released and a swab is pressed over the needle which is then withdrawn and the donor is asked to flex the elbow fully. This stops the bleeding from the puncture. A small dressing of sterile gauze is then applied.

To administer the blood to the patient it is usually best to dissect out a vein. The arm having been sterilized with methylated spirit and surrounded with a sterile towel, the vein is exposed.

A few c.c. of normal saline are placed in the flask which is elevated to allow all the air in the tubing and cannula to be expelled. The vein is now opened and the cannula inserted.

So soon as it is seen that the saline is entering the vein properly, the blood collected from the donor is poured into the flask and so into the vein of the recipient.

Lastly, the vein is ligatured and a dressing and bandage applied with the elbow flexed.

### Precautions.—

1. It is safer to use a freshly prepared solution of sodium citrate made up with tap water than an old solution made up with distilled water.

**BLOOD TRANSFUSION.**

- A. Novocaine for donor.
- B. Methylated spirit for donor.
- C. Syringe for injection of novocaine.
- D. Tourniquet.
- E. Methylated spirit for recipient.
- F. Jug for blood and citrate solution.
- H. French's needle.
- I. Adrenalin and bandage.
- J. Gloves.
- K, L, M, N, O. Instruments for dissecting out the vein.
- P. Citrate solution.
- Q, R. Flask.
- S, T. For ligature of vein.
- U. Dressing.
- V. Novocaine for recipient.



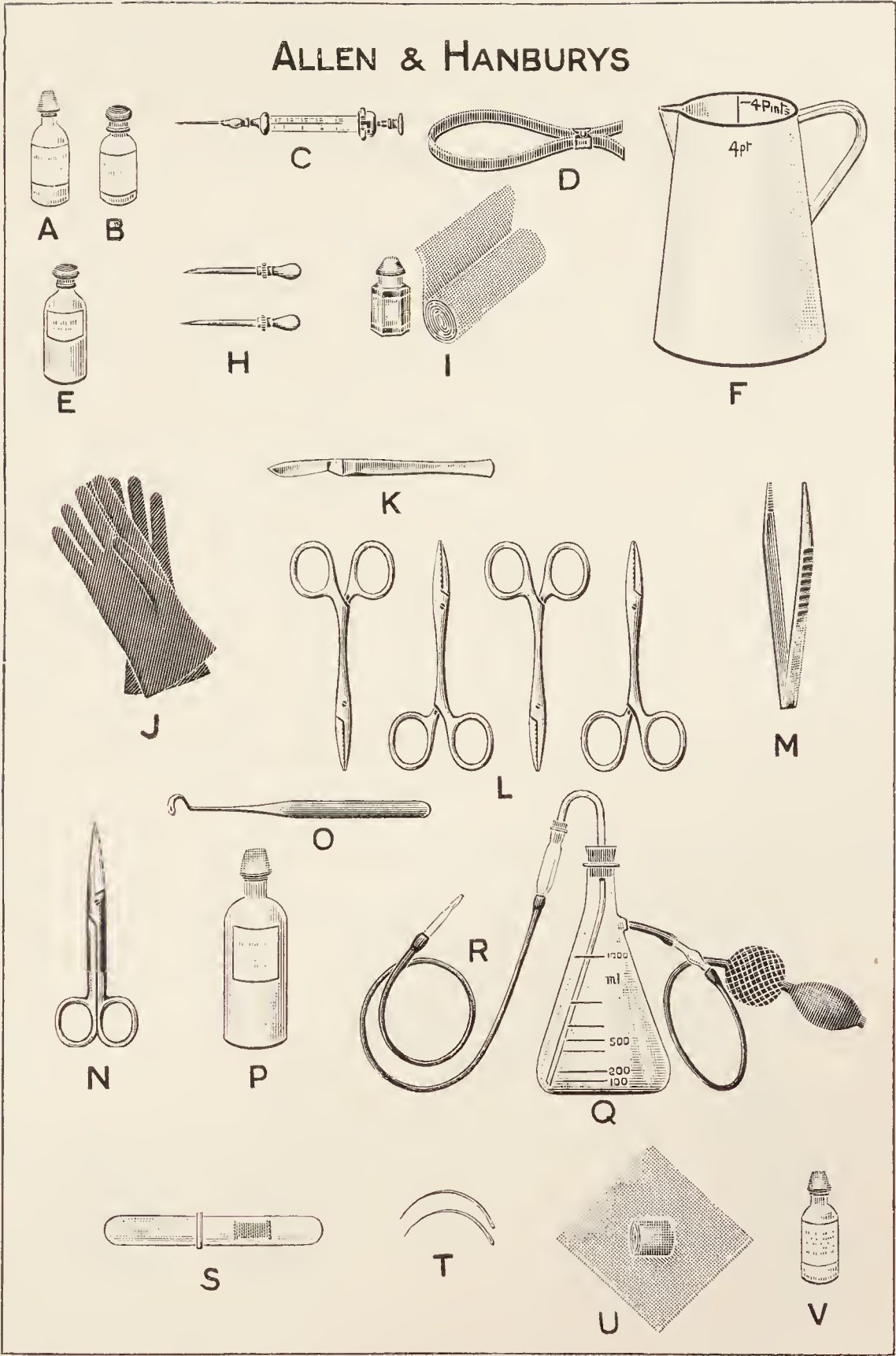


FIG. 44.



Novarsenobillon is a yellow powder, and has to be dissolved in 10 c.c. of freshly distilled water, or 10 c.c. ampoules of freshly distilled water can be obtained.

*Stabilarsan*.—This form of salvarsan is put up in solution in 10 c.c. ampoules ready for use.

Surgical spirit does not discolour the skin like tincture of iodine, and so it is easier to see the vein.

The glass syringe is for the arsenic solution. The 2-inch needle is to draw up the solution from the medicine glass. The  $1\frac{1}{2}$ -inch needles are to inject the solution into the vein. The tourniquet is applied to the upper arm to make the veins stand out. The forceps is to secure the tourniquet. The hypodermic syringe is held in readiness for any vascular symptoms that may arise.



FIG. 45.



*Duties of the Nurse.*—The syringe and needles are sterilized by being placed in cold water which is then brought to the boil, or they may be kept in a jar of methylated spirit. The points of the injection needles must be sharp, and wires must be kept in the needles when not in use. If the syringe and needles have been kept in spirit they must be well washed through with distilled water before use. The nurse may be directed to release the tourniquet.

A full dose 0.9 gm. is given to a robust patient weekly for 9 doses. In the majority of cases the first dose is 0.3 gm. and then 0.6 gm. a week later. Each subsequent dose is 0.9 gm.

*Preparation of the Patient.*—The urine should be tested for albumin, and if this is present the doctor must at once be informed. An aperient is given the night before followed by Epsom salts, or an enema, in the morning. It is very necessary that the bowels should be acting quite regularly, if not, a preliminary treatment with this object in view must be prescribed. Food is not to be given for two hours before the injection. Fifteen minutes before the injection the glucose mixture is given.

*Reactions.*—Rarely during, or immediately after, the injection of novarsenobillon certain vascular disturbances arise. The face becomes flushed, the pupils dilate, the voice is husky, there is tightness of the throat and pain in the chest; such symptoms are not serious. More rarely still dyspnœa, shivering, palpitation, vomiting and occasionally coma may supervene. Patients of plethoric type are most likely to have such reactions, and in them a prophylactic injection of adrenalin 1 c.c. is given five minutes before the injection. In some patients a taste of garlic supervenes following the injection, in which case the patient should be rested before being sent home and further doses of glucose prescribed.

There are certain, but well-marked, symptoms which may occur up to two days after the injection, and late symptoms may arise up to one month. These concern the doctor.

## CHAPTER XXIX.

### X-RAYS, RADIUM, AND RADON.

IN the teaching hospitals a number of patients are treated daily with X-rays, radium or radon, and, practically, every nurse during her training has some experience of these methods. Moreover, a certain number of nurses, when they are qualified, elect to take up posts in the radium or X-ray departments. The author, therefore, assumes that nurses may wish to know something about X-rays and radium, other than the nursing duties associated with these methods of treatment. In the following pages an attempt has been made, by stripping the subject of most of its scientific terminology and assuming on the part of the reader only a very elementary knowledge of physics, to present the matter in the simplest terms. It is impossible to grasp the subject, however, even in its most elementary form, without some knowledge, be it ever so scanty, of the atom.

### THE ATOM.

All solids, liquids, and gases consist of elements which are molecules or atoms of the same kind, termed elementary molecules. Hence we say that an *element* is a portion of matter made up of molecules consisting of identical atoms. Of these elements (not including those radio-active) there are ninety-two. Radio-activity has revealed an additional number, nearly forty, but these are not, except in the most up-to-date chemical tables, included in the list of elements. Compounds, of which there are some hundred of thousands, are composed of different varieties of atoms. The atom is composed of a nucleus circling around which are particles

of negative electricity called *electrons*. The nucleus consists of one or more protons which are charged with positive electricity. The most simple atom is that of hydrogen, which is composed of a central nucleus circling around which is one electron. Quite recently another particle has been identified, and it has been given the name of the *neutron*. All that is known about it is that it is of atomic size and has no electric charge ; hence its name. It probably forms part of the nucleus, but it is difficult to realize how it fits in, since the nucleus was apparently " full up " before.

Hydrogen is numbered 1 because it is the lightest element, and, proceeding up the scale to the heaviest element uranium, numbered 92, the weight of the various elements depend on the number of protons and electrons of which the atoms are composed. If these atoms have sufficient electrons, the latter are arranged in two or more rings round the nucleus. The inner ring of electrons is so firmly held by the proton, or protons, that they are difficult to detach. The outer ring, or rings, is more loosely held and so these electrons are more easily detached. The amount of positive electricity in the protons is equal to the combined amount of negative electricity in the electrons. Thus the power of attraction, or repulsion, of the component parts of an atom is neutralized, and the atoms keep their arrangement peculiar to those elements to which they belong. Thus an atom has been compared to the solar system, the nucleus taking the place of the sun and the electrons, circling around it, that of the planets in their orbit. In 1903 Rutherford and Soddy advanced the theory of atomic disintegration in order to explain the many things that have been found out about radium ; briefly this theory is that some varieties of atoms are not so stable as was thought and are liable to disintegration. No evidence has been obtained of the release of protons in the radium family.

The general idea evolving from this conception of atoms is that they themselves are the sources of a great deal of energy, and that anything which can interfere with their stability will likely result in a liberation of energy. There are various forms of energy. That which concerns us is known as kinetic energy, which is the power of doing work by a moving body in virtue of its motion. The ultimate cause of



light, heat, ultra-violet light, infra-red rays, the making of radiograms by X-rays, and the degeneration, or destruction, of living cells by X-rays or radium, is due to energy. This energy is conveyed in the form of waves, which differ in length and penetrating power according to their source.

The atoms composing an element, or compound, are separated from one another just as the smallest shot contained in a bag are separated by air, although they appear to be touching. If an atom should lose, even temporarily, one electron it is said to be positively charged. If, on the other hand, an atom should gain an additional electron it is said to be negatively charged. This is because normally, as has been stated, the two kinds of electricity just balance each other. Faraday was the first to postulate the existence of these positive or negative charged atoms, or molecules, and he gave them the name of *ions*, which means a traveller or wanderer.

## X-RAYS.

When in 1895 Professor Rontgen was engaged in a research to discover whether there were any other rays, besides those already known, and was using a Crookes tube covered with black paper, he noticed that a barium plantino-cyanide screen, in another part of the laboratory, was brilliantly shining. This illumination, which is due to the radiation of a substance when stimulated by X-rays, is known as fluorescence. Rontgen then realized that there was some kind of rays being discharged from the tube which were able to penetrate the black paper and make the screen fluoresce, and so, obviously, different from the rays of light. He further experimented and found that if he placed an opaque object between the tube and the screen, a shadow of the object was cast on the screen. By taking different objects and thus placing them it was found that the degree of transparency (penetration of the rays) varied with the different objects, and that an ordinary piece of sheet lead prevented any of the rays penetrating. Lastly Rontgen found that photographic plates, wrapped in black paper and enclosed in aluminium boxes, were sensitive to these rays, which he called X-rays, and demonstrated that they could be produced by the arrest of particles of the

cathode stream (see later); in fact, any form of obstacle to the cathode stream causes X-rays to form, and metals are best used because they stop all the electrons fairly easily.

It was due to this discovery that radiograms are able to be taken, since by placing an object, which will allow any rays to penetrate, between a photographic plate and the tube, a picture of the object is imprinted on the plate, or if a screen is used, on the screen. The details of the object depend upon the resistance to the penetration of the rays in its different parts. Thus if the object happens to be the hand, the bones stand out most clearly, the cartilages less clearly and the remaining tissues hardly at all, because they are so easily penetrated by the X-rays.

The next problem to solve was how were these X-rays produced, and to understand this the essentials of a Crookes and Coolidge tube must be described. Those described are the original tubes, and these have been improved from time to time. A Crookes tube consists of a glass bulb which is first filled with air and then pumped out, so that the air is reduced to a very small fraction of its original amount. It is important to notice that Sir William Crookes in nearly all his experiments left some air in his so-called vacuum tube, and one of his observations was the starting-point of a great discovery which has been referred to, namely, that of the electron. Into one end of the tube is sealed the negative plate of an electrical apparatus and into the other the positive plate; called the cathode and anode respectively. When the current is turned on there is found to be an electrical discharge through the tube, and Crookes noticed that this electrical discharge through the gas in the tube produced a peculiar glow which seemed to pass from the negative to the positive terminal. He thought that this glow, which he called the *cathode stream*, consisted of particles smaller than any known atom and so constituted a fourth state of matter. Some years later Professor J. J. Thomson found this to be true, for the glow is really due to the ionising of the gas in the tube, resulting in a flight of electrons from the negative plate; they are particles of negative electricity, and would naturally be repelled from the negative surface. When the current is turned on any positive ions there chance to be in

the tube are attracted to the negative plate and by their impact release the electrons from the atoms therein to form the cathode stream. The positive atoms at the same time have their charge neutralized and probably float off as ordinary gas molecules into the tube again. The cathode stream of electrons dash against the glass of the tube, and the radiation thus originated consists partly of X-rays and mostly of heat.

It was soon found that electric currents at high voltages could be sent through the tubes, but that they could easily be put out of order. Coolidge, of America, therefore, set to work to devise a tube by which the formation of the cathode stream could be so facilitated that much stronger currents could be used. He obtained this result by fixing, to the negative electrode, a plate which was composed of a spiral of tungsten wire which, when the current is turned on, becomes incandescent. Since there is no gas in this tube the cathode stream does not glow. The result of this incandescence is a very great increase in the number of electrons released from the curved plate. Subsequent to the invention of the Crookes tube, Jackson made the cathode curved and inserted a platinum plate at its focus. The assumption, which proved to be correct, being that if the electrons were arrested suddenly by this plate the energy developed in the X-rays would be far greater. Coolidge substituted a tungsten plate for the platinum plate, which was found to act better, and this, with his incandescent focussing plate allowed for the production of X-rays under very much more flexible conditions than were possible with the original types of Crookes tubes. The two essential things in the production of X-rays being (1) their quantity, which depends on the number of electrons, released, and (2) their quality, which depends on the voltage.

## RADIO-ACTIVITY.

Professor Becquerel, knowing that X-rays affected a photographic plate, conceived the idea that fluorescent substances might do the same. Taking some uranium salts, which had been made to fluoresce, and exposing them to a



photographic plate, he found that the plate became fogged, and at first attributed this fogging to the light given off by the fluorescence. Meanwhile he had put away in a dark cupboard some uranium salts and photographic plates and forgot all about them for a time. When eventually he developed the plates he found that they had been fogged just as they had been when exposed to the fluorescent uranium salts in the sunlight. It was thus obvious that neither light nor fluorescence had anything to do with the fogging. Becquerel (1896) named this property of uranium *radio-activity*, and it was soon found that another element, thorium, possessed the same power.

## RADIUM.

Professor and Madame Curie then undertook a research into the relative degrees of radio-activity in various samples of ore containing uranium, and found by their quantitative measurements that the degree of radio-activity depended upon whether the uranium was separated from the ore as pure uranium oxide, or whether the uranium was in its natural state. Thus the chemically pure salt was four times less radio-active than when the uranium was tested in its natural state, that is in an ore. It was thus apparent that the ores in which uranium is found must contain some substance, or substances, of far greater radio-activity than the uranium salt. The ore which gave the greatest amount of radio-activity was pitchblende. Now pitchblende contains aluminium, copper, iron, lead, and phosphoric acid, none of which are radio-active, and so, obviously, the radio-activity must be due to some substance in the residue after the former have been eliminated.

As the result of very prolonged and minute chemical fractionations the Curies obtained from the residue the salts of two new substances which were the sources of the radio-activity. One of these elements was called *Polonium*, after the country in which Madame Curie was born, and the other *radium* (1898). Polonium is not used as a therapeutical agent because it is too short-lived, half its value disappearing in five months.

By further laborious processes Madame Curie was able to obtain radium in a pure state. It is a white metal, but so quickly does it change into radium hydroxide that but few people have ever seen it. It was also found that there is a constant ratio between the amount of uranium and radium in a given sample of ore containing uranium, from which it was gathered that uranium was the parent of radium. That is, by steps which need not detain us, uranium is gradually changed into radium. The quantity of radium in a sample of pitchblende is very minute; thus in one ton of ore there are only 200 milligrams of radium. It is because of the long and elaborate processes on such a large mass of ore to obtain such a small quantity of radium that this metal is so expensive, the present price being £16,000 a gram. This price would undoubtedly be reduced if an ore could be found which was richer in uranium. At the present time, however, the Radio Belge has the monopoly, the ore in their mines in the Congo containing the largest amount of uranium.

The next problem to solve was, why is radium radio-active, in other words, what is the source of its radiations? By experiments which are very intricate and need not be described, it was found that these radiations were due to atomic disturbances, with the result that the formation of the atoms was so altered that they gave off certain amounts of energy. Just as the atoms in the components of a cartridge inserted in a gun can be so disturbed when the trigger is pulled and the cap is fired that an enormous amount of energy is released, so it is with the atoms of radium, only in this case we do not know what, so to speak, fires the cap. Since this disturbance of the atoms is always taking place, it is said to be spontaneous, for want of a better reason.

When the atoms of radium are disintegrated two kinds of particles and one of rays are given off. Thus if a salt of radium is enclosed in a hermetically sealed glass box it is found that particles of *helium* are given off and that these come from the nuclei. It was first thought that such radiations were rays and so the first products of the atomic disturbance were called *alpha rays*. This is unfortunate, since the helium is composed of particles. As the result of this alpha radiation those radium atoms which have been disturbed are converted into

another element, the emanation called *radon*, a gas. Radon emits alpha particles and is converted into a solid element called *radium A* which emits alpha particles. This element is quickly converted into *radium B* which emits beta particles and gamma rays. The beta particles are electrons detached from the atoms of radium B. The latter element is converted into *radium C* which emits alpha and beta particles and gamma rays. Radium C is converted into *radium D* which emits beta particles only. Radium D is converted into *radium E* which emits beta particles and gamma rays. Radium E is converted into *radium F* which emits gamma rays only and radium F is converted into *lead* from which there is no radiation. In the case of radium C the gamma rays are very penetrating and are the rays which are so useful in radio-therapy. It is not known, in the case of radium, how the gamma rays are produced. The answer to this question varies from year to year. The gamma rays are really X-rays but of shorter wave-length than as yet can be obtained with an X-ray apparatus. It would be possible to generate X-rays with a penetrating power equal to the gamma rays of radium with 1,000,000 volts, but X-ray tubes at present will not stand electrical pressure to anything like this voltage. Thus it will be seen that the atom is a natural X-ray apparatus.

The penetrating powers of the particles are very slight so that, for instance, a piece of paper will stop alpha particles and a sheet of silver, about a millimetre thick, absorbs nearly all the beta particles, whereas the effective protection against gamma rays is secured only by appreciable thicknesses of lead. It is largely because of their penetrating powers that gamma rays are used for treating malignant growths. Moreover, gamma rays, if used properly, do not injure healthy living cells unless they are immature. Beta particles, however, are very injurious to living healthy cells. It is because of this action of the beta particles that radium when used has to be enclosed in an appliance of metal which absorbs the beta particles. The latter, however, by their action on the atoms of the metal disturb some of its atoms and the radiation thus released in the form of gamma rays is called *secondary radiation*. The quantity of this does not amount to much.

The changes from radium C to lead take a far longer time



than those from radon to radium C. The alpha particles, that is the helium, can be extracted from the glass box. Thus we have the phenomenon of one element changing into another which leads one to think that there was something in the alchemists of old trying to change other metals into gold. But we should do well to remember that this radio-active process is entirely spontaneous and that no one can bring it about. So far as is known uranium, thorium, potassium, and rubidium are the only metals which possess this power.

The first experimental demonstration that radium could produce a cutaneous erythema was that of Walkoff in 1900, though such effects had been known to occur with X-rays, which had been used by many medical men between 1896 and 1900.

### DIAGNOSIS BY X-RAYS.

X-rays are used to diagnose fractures, diseases of joints, heart, lungs, kidneys, and intestine by means of a barium meal. For this purpose radiograms, or screens, are used and it is not necessary to discuss this method further. They are also used in the form known as deep X-ray therapy for certain diseased conditions.

### DEEP X-RAY THERAPY.

Deep X-ray therapy is employed in gynæcological practice for the treatment of serious hæmorrhage due to fibroid tumours of the uterus or to chronic metritis. X-rays are also employed in the case of a malignant ovarian tumour if an operation is contraindicated. In such cases the results, but only for a time, are most striking, the tumour being reduced in size considerably and all demonstrable ascites disappearing. Other gynæcological conditions in which X-rays are employed include the determination of sterility by a dose of rays sufficiently strong to destroy the Graafian follicles, or the cure of sterility by small doses sufficient to stimulate the ovaries. With a view to determine whether the Fallopian tubes are permeable, they are injected with lipiodal and a radiogram is then taken. Specially selected doses have been known to cure amenorrhœa.

Good results have been obtained in leukoplakia and carcinoma of the vulva.

Deep X-rays are employed, with or without radium, for cancer of the uterus and as a prophylaxis after the radical operation for this disease, and after the removal of malignant ovarian tumours, with the purpose of destroying any cancer cells that may have escaped removal at the operation.

In the case of chronic metritis, and of some fibroid tumours of the uterus in women 38 years of age or over, medium voltage therapy will arrest the bleeding by causing atrophy of the ovaries and so inducing the menopause. As regards the treatment of fibroid tumours by medium voltage therapy, the tumour must not present any symptoms or signs of degeneration, and must not be so large that its size is the reason why the patient has sought relief, since the shrinkage resulting will probably not be sufficient to relieve her to any extent.

As regards the treatment of cancer, radium alone gives better results than X-rays alone, but the best results are to be obtained with a treatment combining the use of radium and of X-rays.

### Preparation of the Patient.

*Day Prior to the Treatment.*—The patient should be directed to drink plenty of water, barley water, or lemonade, and her diet should consist of clear soup, boiled fish, boiled chicken, milk pudding or custard ; or as near to such a diet as she can obtain. At any rate the meals must not be “heavy.” Potatoes or pastry are not allowed. An aperient is not required if there is a good morning action of the bowels, otherwise an enema should be given. A mixture of 10 grains of calcium chloride in half an ounce of peppermint water should be taken after the three regular meals. Metallic drugs must not be given.

*Day of the Treatment.*—The breakfast should consist of a cup of tea and some toast and butter, and in addition the patient should drink plenty of one or other of the aforementioned fluids. One dose of the calcium mixture should be taken after breakfast.

*After Treatment.*—The patient should rest for the remainder of the day. If sickness supervenes she should be given a

teaspoonful of bicarbonate of soda in half a tumblerful of water, and this can be repeated.

The meals after treatment should, for the next two or three days, be of the nature of those indicated for the day before the treatment.

*Duties of the Nurse.*—During the treatment the nurse remains outside the closed cubicle, keeping the patient under constant observation through the window, so as to be available if the patient wants her.

*Signs of Reaction to the Treatment.*—Malaise, nausea, and vomiting.

## RADIUM THERAPY.

**Radium.**—For clinical use, the chemical processes entailed in extracting radium are arrested at the stage when a salt of radium is obtained, and this for three reasons:—

1. The additional expense of obtaining radium in a pure state would be very great.
2. It is practically impossible to keep radium in a pure state, since its chemical reactions are such that it changes, almost at once, into radium hydroxide.
3. Even if pure radium was available, no one could afford to obtain a sufficient supply to fill the containers. Moreover, the salt of radium, because of its expense, cannot be used to fill the containers completely, and, therefore, to prevent an uneven action on the tissues, because part of the container would be empty, the salt is mixed with magnesium oxide, an inert powder, and thus an even distribution of the radiation is obtained, which is most important. The salt of radium generally used in the containers is the sulphate, because, being insoluble, there is less risk of leakage should the container be damaged.

**Radon.**—Radon gas is prepared as follows: Radium chloride, because it is the most soluble salt, is put into a flask half-full of weak hydrochloric acid. The flask, to which a glass tube is attached, is contained in a box covered with several inches of lead.



The gases given off consist of oxygen, hydrogen, radon, and a little carbonic acid from the action of radiation on organic substances in the water or in the apparatus.

1. The oxygen and hydrogen are converted into water by an electric spark.
2. The excess of hydrogen is converted into water by combination with oxygen emanating from a red-hot copper wire.
3. The water is absorbed by phosphorous pentoxide, the carbonic acid by caustic potash, and the radon being incapable of entering into any chemical combination can then be pumped off.

The various processes take place in different flasks of the apparatus. The properties of radium and radon are the same but the rate of decay of the latter is immensely quicker.

*Advantages of Radon.*—The dose can be varied in individual cases. That is to say, if the surgeon requires a certain dose for treating a patient he can be supplied with it, whereas the exact amount of radium salt he requires may not be available.

Radon can be put up in any quantity from time to time. The available supply of radium may be in use in another patient.

Risk of loss is less; this is important from a financial point of view, because the monetary value of radon soon declines while that of radium, which is a most expensive metal, lasts almost indefinitely. Because of its little intrinsic value, radon can be used for "walking patients" or experiments.

When radon is used for the tonsil, tongue, or œsophagus, if the thread holding the container breaks, an immediate operation is not necessary to recover it as in the case of radium, since the container will be passed *per rectum*, while the glass seeds of radon can be left *in situ*.

*Disadvantages.*—Much more manipulation is required, therefore there is greater danger to those concerned with the production of radon.

Intricate measurements have to be made requiring an adequate knowledge of physics.

The apparatus may break down.

It is difficult to calculate the exact dose required in a certain case, although this can be estimated up to a certain point.

Nevertheless, the physicist always provides a greater dose than is required when the radon is first applied so that, although the radon is disappearing, the patient will, in the end, obtain the proper dose.

It is known, however, that the cells of the body (healthy and cancer) react differently according to whether too great a dose or too small a dose is given, and herein lies the danger, if there is any, since when radon is used the cells at the commencement of the treatment will be getting too large a dose and towards the end too small a dose, although the total dosage may be correct. This danger is probably absent when the treatment is of short duration, say 24 hours, but in some cases the treatment lasts days.

**Teleradium.**—A bomb, or as the French and German radiologists call it, a cannon, is the concentration of a large quantity of radium sulphate in one applicator. The amount contained in a bomb may be 1, 2, 3, 4, 5, 8, 10 grams, and it is proposed to have a bomb of 16 grams in Brussels. This method of treatment is known as teleradium.

The idea underlying the use of a bomb is to apply such a large dose of gamma-rays through the skin that they can penetrate to deep-seated cancers. Also to apply large doses to cancer in any part of the body, without injuring the superficial tissues, since the bomb can be fixed at varying distances from the patient.

Lastly, a greater number of patients can be treated with a bomb than with X-rays however powerful, since the bomb can be used throughout the 24 hours, whereas X-rays can only be used for a certain time every day, owing to the expense of having more than one set of experts to look after the apparatus.

### **Duties of the Nurse.**—

A nurse who is working in a Radium Unit may have to—

1. Sterilize the tubes, needles, and applicators, which can be done by boiling them, or inserting them in lysol or carbolic acid. Mercury and iodine solutions must never be used because the metal will be injured.
2. Clean the tubes, needles, and applicators after use, which can be accomplished with acetone, benzine, chloroform, ether or petrol.

3. Examine all dressings removed when the tubes, needles, and applicators are taken out, as a precaution against loss.
4. Keep the radium in a safe repository after its removal until such time as the radium officer attends to take it away to his radium safe. In all properly organized radium units a safe in the ward, or closely adjacent, is provided for this purpose. In some hospitals also the dressings are put in a special pail, painted red, and are not thrown away until the radium officer has applied an electroscopic test, to ensure that there are not any containers in the dressings.

In addition—

1. The nurse must never let a patient, in whom radium or radon has been inserted, get out of bed to go to the lavatory, or if the patient is being treated in the out-patient department, then she must not let the patient go to the lavatory without first removing the radium or radon, reapplying it on the return of the patient. The latter concerns superficial applications.
2. She must at once inform the Sister or Doctor concerned if the dressing, such as the gauze when vaginal applicators are used, comes out, or partly out. If, for instance, the applicators applied to the neck of the uterus slip away from the growth they may burn the vaginal walls with the result that recto-vaginal or vesico-vaginal fistulæ are formed. Such fistulæ may not make their appearance for some months.
3. Any dressings removed from the patient are never to be thrown away, or destroyed, until all the applicators and containers have been accounted for.
4. All excreta (urine and fæces) must be examined before being thrown away in case an applicator or container may be contained therein.
5. The number of containers and applicators must be checked with the number written on the label attached to the patient. This rule does not apply to the nurse unless she has been directed to remove the containers or applicators.



6. Any discrepancy between the number of containers or applicators received and that entered on the label must be at once reported to the surgeon.
7. She must remember that radium is a most expensive metal. Every precaution, therefore, must be taken to prevent its loss if only because radium has to be insured, and the present low rate of insurance granted to hospitals is based on the assumption that the greatest care will be taken, since any considerable loss might result in the premium of insurance being raised, and hospitals are badly enough off for funds as it is.

It is the experience of the National Radium Commission that most of the losses of radium are due to great carelessness on the part of some member of the staff concerned with the treatment of patients with radium.

*Containers.*—Radium salt, or radon, is filled into containers, which differ according to the use to which they are going to be put. There are four main varieties :—

1. Needles, with sharp points, when it is decided to insert the container into the growth.
2. Tubes, with blunt points, when intra-cavitary methods are being employed.
3. Seeds when the container is going to be left in the growth.
4. Plaques, or capsules, for the treatment of superficial lesions.

The needles, tubes, and plaques are made of gold, platinum, silver or other metals. The three former are generally used because, with the correct amount of filtration, they can be made thinner and so do not take up so much room. The seeds are capillary glass tubes filled with radon. With the exception of the seeds, all the containers are removed at the conclusion of the correct dose.

When used for cancer of the cervix uteri, tubes are almost universally employed. It is now recognized that the method of inserting needles into the growth is not nearly so efficacious.

*Applicators.*—These are of various shapes, and made of one or the other metals mentioned, into which the tubes are inserted. Applicators are used to house the tubes when the

latter are to be introduced into some of the cavities of the body, so that the surface of the growth can be covered in order to obtain the most efficient radiation. This is the only use of applicators since, although the metal thereof is an extra protection against the beta-rays, if this only was necessary the escape of such rays can be effected by increasing the thickness of the metal of the container.

*Velocity of the Rays.*—Alpha particles are projected at a velocity of about 10,000 miles a second. Beta particles are projected at a velocity up to 180,000 miles a second. Gamma-rays are projected at a velocity of 186,000 miles a second.

*Time period* (the time it takes to decay to half its value) of radium is 1690 years; that of radon 3·85 days; of radium A, 3 minutes, of radium B, 28·8 minutes, of radium C, 19·5 minutes, radium E, 5 days, radium F (polonium), 136 days. The time period of uranium is 5,000,000,000 years.

A nurse who intends to take up a post in a radium unit will find *An Elementary Handbook on Radium*, by D. F. Clephan and H. M. Hill (Oxford Medical Publications), most useful.

### INSERTION OF RADIUM. (Fig. 46.)

- A. Clover's crutch if an operating table is not available.
- B. Sims's speculum.
- C. Auvard's speculum.
- D. 4 Towel clips.
- E. Curette.
- F. Ring forceps.
- G. Dissecting forceps.
- H. Volsellum.
- J. Uterine sound.
- K. Fenton's dilators 1 to 6.
- L. Flat applicator covered with india-rubber bag.
- M. Tubular applicator covered with india-rubber tube.
- N. Silkworm gut.
- O. Silk.
- P. Gloves.
- Gauze.
- Specimen bottle.
- Benzine.
- Tincture of iodine.

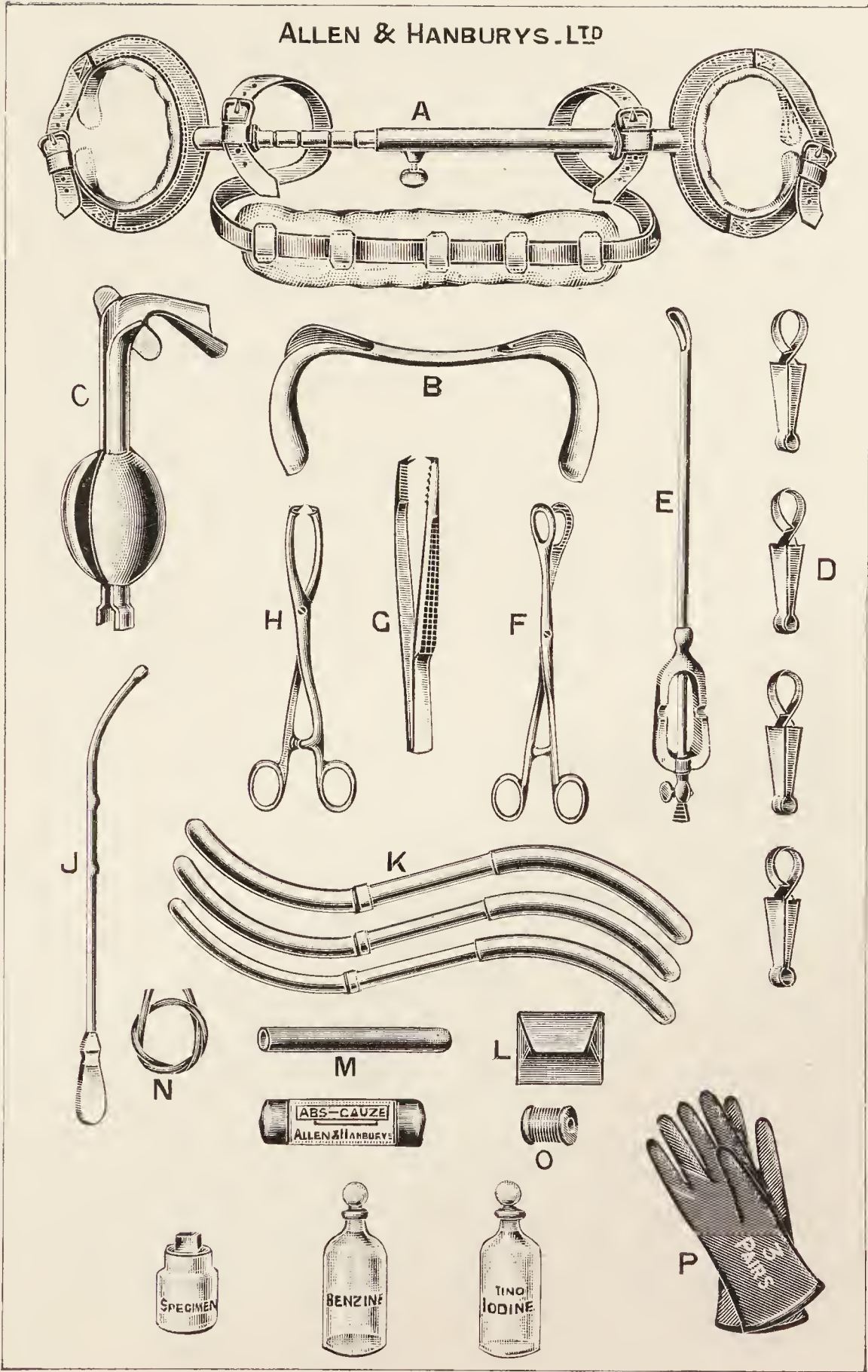


FIG. 46.



So as to ensure that the presence of cancer of the body or cervix of the uterus is not overlooked when a patient is to be treated with radium for chronic metritis, a sharp curette is necessary ; also to dig a piece out of the neck of the uterus in cases of cancer so that it can be microscoped. The ring forceps is to insert the gauze into the vagina after the applicators containing the radium salt, or radon, have been inserted. The india-rubber bags are to cover the applicators to prevent secondary radiation. The silk to tie the covering on, and the silkworm gut to tie on to the intra-uterine applicator so that it can be pulled out. The benzine is used as an antiseptic to swab out the vagina in cases of cancer. The tincture of iodine for the same purpose in cases of chronic metritis.

The specimen bottle is required to hold the specimen which has been removed for microscopical examination.

The gauze is to plug the vagina and to prevent the applicator slipping out of the uterus, and the vaginal applicators slipping away from the growth, and in the case of the vaginal applicators the gauze is also used to separate them from the vaginal wall so as to obviate, so far as possible, the risk of rectal or vesical fistulæ.

*Preparation of the Patient.*—As for a curetting. In addition a label must be attached to the patient on which is written the number of applicators and containers inserted.

*Duties of the Theatre Sister or Nurse.*—The instruments are sterilized in the usual way. The radium sulphate, or radon, will be delivered to the sister in an intra-uterine applicator if the case is one of chronic metritis, or in an intra-uterine applicator, and vaginal applicators if the case is one of malignant disease. Silkworm gut is threaded through the eyelets of the intra-uterine applicator and tied in, after which the applicator is inserted in a special rubber bag, the open end of which is tied with silk, the unattached ends of the silkworm gut hanging free ; the whole is then sterilized by boiling and placed in a sterilized tray ready for use. The vaginal applicators are inserted into rubber bags which are tied on securely with thread, the ends of the thread being left long and hanging free. These applicators are sterilized in the same way.

For the treatment of chronic metritis the radium, or radon,

is inserted into the cavity of the uterus only ; for the treatment of cancer it is inserted into the uterus and also into the fornices of the vagina, and if these are obliterated then up against the growth.

The applicators are left in the uterus and vagina in cases of cancer, or in the uterus only in cases of chronic metritis, so long as the surgeon directs.

*After Treatment.*—In cases treated for chronic metritis the patient is able, as a rule, to return home on the third day if she wishes.

When cancer of the cervix is being treated the patient is kept in the hospital, or nursing home, for 14 days, the second dose being given at the end of a week. She is allowed to get up after the fourth day, if there is not any temperature, and leave four days after the third application, which is made three weeks after the second.

Many patients complain of headache and nausea following the use of radium, or radon, and its use is always followed by a brownish discharge for some weeks, and a few patients have a slight temperature for a day or two.

### **Dangers of X-rays.**

*Nurses.*—In the modern X-ray department for therapy, the nurse does not run any particular risk. She sits behind a leaded glass window in full view of her patient and does not enter the room until the current has been switched off. The necessity for ample protection of walls, as provided for in the Recommendations of the X-ray and Radium Committee (now the International Standard of Protection), is well known and always adopted by the manufacturer. The blood of the nurses should be examined every six months by a competent physician.

*Patients.*—There is a distinct danger associated with medium or high voltage therapy, unless given by an expert, namely, burns, which are very serious and take many months to heal. Another danger is that a patient may be treated for chronic metritis or fibroid of the uterus by X-rays without an examination of a specimen obtained by a previous curetting has shown that the bleeding was, or was not due to malignant disease. Moreover, some pelvic or abdominal tumours may appear to be fibroids on clinical examination when they are really ovarian or inflammatory in nature.

## Dangers of Radium.

*Nurses.*—The danger of over-exposure to radium, or radon, can be avoided by the provision of efficient protection and suitable working conditions. The known ill-effects on people handling radium, or radon, to be guarded against are :—

- (a) Injuries to the superficial tissues of the hands due to the destructive action of the beta-rays, which may result in permanent damage.
- (b) Radio-sensitivity of the vascular system, and of the internal organs, especially of the ovaries and testes. The detection of such injuries is most important since their early manifestations are often unrecognized.

In order efficiently to protect nurses :—

1. If a nurse is handling radium, or radon, a screen of lead, not less than 1 inch in thickness, should be erected on the bench, on which the tubes, needles, and surface applicators are being prepared, between her body and her hands. Proximity to the radium, or radon, should occur only during the manipulations and for as short a time as possible.
2. Nurses engaged in such work should be on duty in the department not more than six months at a time, and should have extra leave off duty.
3. The radium, or radon, should be carried from place to place in long handled boxes lined on all sides with 1 cm. of lead.
4. Periodic tests should be made every three months of the blood of any nurse handling radium, or radon, by a competent physician, who will be more conversant with the early changes therein, if any, than a radium officer.
5. In order to protect the hands from beta-rays, reliance must be placed, in the first instance, on distance. The radium, or radon, containers and applicators should be handled with a long forceps, preferably made of wood, the nurse should wear rubber gloves, and all manipulations should be carried out as rapidly as possible.



*Patients.*—There are three dangers to patients associated with the use of radium, or radon: the loss of a needle or tube containing the radium salt, or radon; burning of the patient, and septic infection.

1. The container containing the radium salt may be lost by being thrown away in the excreta or dressings or an applicator may be lost, and it is for this reason that some of the above rules were made. Radium may be “lost” temporarily if the material used for pulling out the containers breaks, in which case great difficulty may be experienced in removing the container if it is buried in the tissues and much inconvenience if it is in the uterus, necessitating, perhaps, another anæsthetic. Moreover, the patient may be nervous, or “troublesome,” and refuse to allow any further trial to be made to remove the container. The author once had such an experience. The silk attached to a bunch of needles, which were used in those days, buried in a cervical growth, broke as the sister was pulling on it to remove them. The radium salt in use was not only worth £3000 but would also have killed the patient if left *in situ*. The patient refused to have any further treatment, and in spite of the entreaties (one may say) of the sister, nurses, resident medical officer and house surgeon, the patient got up, dressed, and expressed her intention of leaving the hospital after dinner. The author arriving at about that time persuaded the patient to let him examine her in the dark room under X-rays. The patient agreed to this, and the needles were observed to be lying in the broad ligament, having moved from their original position. With a little more persuasion the author was allowed to pass a pair of forceps up the vagina, through the growth, which was very advanced, and into the broad ligament. The end of the forceps could then be seen as well as the bunch of needles, which were grasped and removed. It was after this experience that silkworm gut was substituted for the silk. Other surgeons have had a similar experience of the silk breaking.

2. If the uterine applicator slips out of the uterus into the vagina, the latter may be burnt, and if the packing becomes loose and the vaginal applicators slip away from the growth, vesico-vaginal or recto-vaginal fistulae may result.

3. Septic infection is a serious complication and may occur

if the patient has some septic focus before the application of the radium salt, or radon. Thus if the patient is found to have a dilated Fallopian tube, or tubes (pyosalpinx), the radium treatment should not be commenced until the diseased tubes have been treated surgically. Moreover, even if the Fallopian tube be not dilated but merely septic, the application of radium salt or radon, in cases of cancer of the uterus, may lead to a pyosalpinx forming and a resulting peritonitis, which conditions have to be dealt with surgically. The cause of most of the deaths following the intra-uterine application of radium, or radon, is septicæmia or peritonitis.

### WHOLE-TIME WORKERS.

The following working conditions are recommended by the X-ray and Radium Protection Committee:—

1. A separate room should be provided for the “make up” of the tubes, needles, and surface applicators, and this room should be occupied only during such work.
2. Not more than seven working hours a day.
3. Sundays and two half-days off duty each week, to be spent as much as possible out of doors.
4. An annual holiday of one month, or two separate fortnights.
5. Sisters and nurses employed as whole-time workers in X-ray and radium departments should not be called upon for any other hospital service.

## PART XV.

### CHAPTER XXX.

#### PRE-OPERATIVE EXAMINATION AND PREPARATION OF THE PATIENT.

BEFORE being subjected to any operation the patient must be prepared, and such preparation should include rest in bed, a report on the pulse, temperature, and respiration, douching, shaving, bathing, and preparation of the skin over the operation area. In addition, the bowels, bladder, and dress have to be attended to, and the urine should be tested, and if possible the quantity passed measured, while the patient must not take any solid food for several hours before the operation.

**Rest.**—In all cases, if possible, the patient should be kept in bed for the 24 hours before the operation. For the operation of posterior colporrhaphy and perineorrhaphy it is better to increase this period to two days at least, so that the bowels may be well emptied. Lastly, patients suffering from cardiac, pulmonary, or renal disease, or from the effects of uterine hæmorrhage, may, when an operation is indicated, require a longer rest than this.

Since before an operation patients are, naturally, apt to be nervous and apprehensive, some surgeons prescribe a sleeping draught of medinal, grains  $7\frac{1}{2}$ , or dial, grains  $1\frac{1}{2}$ , dissolved in warm water, for a night or two before the operation.

**Pulse.**—The rate and character of the pulse should have been noted carefully as long as possible before the operation, and its frequency charted regularly twice daily. Such a procedure is most important. Some nurses are apt to be careless in not charting the pulse-rate before the operation, and it may be that during this time the rate has been above or below normal. After the operation a similar rate continuing, the operator may be puzzled as to its cause when after all it may be the normal for that particular patient.



**Respiration.**—The respiration-rate should be charted, and if the patient is troubled by a cough this should be reported to the doctor.

**Temperature.**—The temperature should be charted twice daily unless the doctor orders this to be done more frequently. The same remark applies, as to the importance of recording the respiration-rate and temperature before the operation, as to that of recording the pulse-rate.

**Mouth.**—It is very essential that the mouth and teeth of the patient should be attended to, if possible, before an operation so that if the teeth are decayed, and if there is time, a dentist should be consulted. Certainly some cases of septic pneumonia after operations can be traced to the filthy state of the patient's mouth.

The patient must be made to clean her teeth two or three times a day, using some efficient mouth-wash such as glycothymoline or peroxide of hydrogen, and if she is too weak to do this the nurse must do so for her with dabs of wool soaked in glycothymoline and held by forceps.

**Urine.**—It is very necessary that a proper examination should be made of the urine before the operation. It may be highly dangerous to operate on patients suffering from such diseases as diabetes or nephritis, and these conditions may not be suspected until an examination of the urine discloses the fact that it contains albumin, pus, sugar, or blood.

If such an examination is not made cystitis, for instance, if present, may be attributed to the carelessness of the nurse if she has had to pass a catheter.

The following tables will serve as a guide for the examination of urine :—

### 1.—Ascertain the Quantity from which the Specimen is taken.

*Normal amount is from 40 to 60 ounces in twenty-four hours.*

The quantity of urine is decreased with—

Fever.

Heart disease.

Acute nephritis.

Some cases of chronic nephritis.

Peritonitis.

*Severe hæmorrhage, vomiting or diarrhœa.*

By certain drugs such as opium or ergot.

Some surgical diseases of the kidneys.

After an abdominal operation the quantity of urine passed for the first day or two will generally be less than normal, due to the fact that the patient will not be taking much liquid.

In certain cases of shock after operation the quantity of urine passed is markedly reduced. This is especially noticeable after the radical operation for carcinoma of the cervix uteri.

The quantity passed in the natural way may also be reduced if there is a vesico-vaginal fistula or a uretero-vaginal fistula, complications due to sloughing after a difficult operation involving the ureters and bladder, such as in some operations for cancer of the cervix.

If one or both ureters are tied in the course of an operation, a very rare accident, the amount of urine will be decreased if one ureter has been tied and urine will not enter the bladder if both ureters have been tied.

The quantity of urine is increased with—

Diabetes.

Hysteria.

Most cases of chronic nephritis.

When a quantity of fluid is taken and by the action of certain drugs such as acetate of ammonia, potassium citrate, and digitalis.

## **2.—Notice the Colour, the Clearness, and the Presence or Absence of Deposit.**

Urine should not be stirred before testing, since if there is a deposit this should be tested separately.

*A slight cloud due to mucus is normal.*

(a) *The specimen is clear.*

Normal urine is a clear straw-colour.

It is darkened if the quantity of urine is diminished, and pale when the quantity is increased.

Bile colours urine very dark olive-green.

Blood from the kidney colours the urine black, or gives it a smoky appearance, according to the quantity of the blood.

Blood from the bladder colours the urine red.

Certain drugs colour urine, e.g. carbolic acid turns it olive-green.

Phenolphthalein, by mouth, colours an alkaline urine red.

*(b) The specimen is not clear.*

The cloudiness or deposit may be due to—

Urates (when the cloud will disappear on boiling).

Pus.

Mucus.

Phosphates (soluble in dilute acids and do not disappear on boiling).

Blood in quantity.

Urates are usually yellow or brick-red in colour. Their presence is of little importance. They occur in febrile states, and in health in concentrated urines, as for instance after vigorous exercise.

### 3.—Test the Reaction.

Acid urine turns blue litmus paper red and has no effect on red litmus paper.

Alkaline urine turns red litmus paper blue and has no effect on blue litmus paper.

Normal urine is acid.

It may be alkaline after a meal, especially of vegetable food; in some cases of cystitis; while the patient is taking certain drugs such as citrates, and also from decomposition on exposure to air. If the urine is alkaline it must be made acid by a few drops of dilute acetic acid before applying further tests.

### 4.—Take the Specific Gravity.

The temperature of the urine should be, approximately, that of the room temperature.

See that the urinometer floats and stands clear of the sides of the vessel: read the number with the eye on a level with the surface of the urine.



The normal specific gravity is between 1015 and 1025.

*A low specific gravity* may be only temporary ; if permanent it suggests kidney disease.

*A high specific gravity* with pale urine suggests diabetes.

### 5.—Examine for Substances in Solution.

These may be—

Phosphates.

Albumin.

Blood.

Bile.

Glucose (also called grape sugar and dextrose).

*The presence of one substance does not preclude that of another.*

#### A. Test for Albumin (Protein).

##### *Boiling Test.*

Fill a *clean* test-tube for about 3 inches with the specimen of urine which has been filtered : hold the tube over the naked flame of a spirit lamp so that the upper half of the urine is boiled, leaving the lower half cool to compare it with. If the boiled portion be *clear* the urine does *not* contain phosphates, albumin, blood, or pus. If the boiled portion be *cloudy* it probably contains phosphates or albumin. Add a few drops of dilute acetic, or one drop of nitric acid, when if the cloud is due to phosphates it will disappear, as the acid dissolves phosphates and not albumin.

##### *Nitric Acid Test.*

Pour a small quantity of nitric acid into a clean test-tube ; allow a similar quantity of urine to trickle steadily down the side of the test-tube. Where the two fluids meet a ring of coagulated albumin is seen.

This test is useful if a small quantity of urine only is available.

##### *Salicyl-Sulphonic Acid Test.*

Pour a few drops of salicyl-sulphonic acid into the urine. If albumin is present small “cloudy streams” will be seen sinking to the bottom.

The quantity of albumin may be ascertained by Esbach's albuminometer. This is a graduated corked test-tube. Filter the urine if not already clear, and if alkaline, render it slightly acid with dilute nitric acid. If the specific gravity is 1010, or over, dilute the urine sufficiently to reduce the specific gravity below that level. Fill the tube with urine up to the mark (U). Add the reagent (Esbach's solution of picric acid and citric acid) up to the mark (R). The tube is then gently inverted a few times to allow the fluids to mix, after which it is corked and kept standing upright for twenty-four hours. The albumin that is deposited is read off on the graduated marks, which represent grams of dried albumin per litre of urine. The percentage of albumin is obtained by dividing by 10. Allowance must be made if the urine has been diluted before the estimation was undertaken.

#### B. *Test for Blood.*

Boil and cool. Add  $\frac{1}{2}$  inch of glacial acetic and mix. Add 1 inch of ether and invert the tube several times. Into another test-tube add  $\frac{1}{2}$  c.c. of alcoholic guaiac solution and 2-3 c.c. of ozonic ether. Pipette the ethereal extract from the first tube into the tube containing the guaiac and ozonic ether. If blood is present a blue colour will develop. Pour about an inch of urine into a test-tube and add one drop of tincture of guaiacum, then add an excess of ozonic ether letting it run down the side of the test-tube : if blood is present a blue ring will form where the fluids meet.

#### C. *Test for Bile.*

##### i. *Bile Pigments.*

*Bile in the urine* in any quantity always colours it. Fill a test-tube  $\frac{3}{4}$  full of urine. Shake vigorously. If the urine contains bile the froth will be coloured yellow. Run a few drops of urine from a pipette on to a white tile and beside them a few drops of strong nitric acid ; allow the urine and acid to run together ; where the

two fluids mix a passing play of colours, of which one *must* be green, will appear if bile be present.

Add 0·5 per cent. tincture of iodine drop by drop to the urine. A dark green colour develops.

ii. *Bile Salts.*

*Hay's Test.*

Place the urine in a glass beaker. Sprinkle some sublimed flowers of sulphur on the surface of the urine. If bile acids are present the sulphur sinks, sooner or later, in accordance with their percentage.

D. *Test for Sugar.*

If the urine is pale, increased in quantity, and of high specific gravity, sugar should be suspected.

A small quantity of freshly made Fehling's solution is poured into a test-tube and boiled, an equal quantity of urine is then added and heated—an orange-red deposit proves the presence of sugar. Instead of Fehling's solution, its component parts may be used separately—the liquor potasse and the urine being boiled together first and a few drops of sulphate of copper solution then added; if sugar is present the result will be the same.

*Benedict's Test.*

Place 5 c.c. of Benedict's reagent into a test-tube and add 8 drops of urine. Boil over a flame for 5 minutes.

Some idea of the amount of sugar present may be obtained by allowing the tube to stand for a few minutes.

Greenish liquid without deposit, 0·1 per cent.

Yellowish deposit with greenish liquid alone, 0·2 per cent.

Orange deposit with colourless liquid alone, more than 2 per cent.

*The quantity of sugar* may be estimated by the *fermentation test*. Take the specific gravity and place the urine in a corked bottle with a small quantity of German yeast, leaving a hole in the cork. Leave the bottle in a warm



place for twenty-four hours, then use the sugar test to be sure that the sugar has all disappeared, and if such be the case subtract the present specific gravity from that of twenty-four hours ago, and the difference is a rough estimate of the number of grains of sugar in each ounce.

The specimen for this estimation must be taken from the collected quantity passed in twenty-four hours.

The nurse must remember that a vaginal discharge of blood or leucorrhœa may easily contaminate the urine as it is being passed, in which case the test for these substances would be positive. There is no chance of the nurse failing to remember this in the case of a vaginal discharge of blood (menstruation, etc.), as she will see the blood when attending to the patient. A leucorrhœal discharge, however, may easily escape notice, and if, therefore, only a little albumin is found on testing the urine the doctor will require a catheter specimen. A large quantity of albumin will not be due to leucorrhœa.

#### *E. Tests for Acetone Bodies.*

##### *i. Aceto-acetic Acid or Diacetic Acid.*

###### *Ferric Chloride Test.*

Add a few drops of 10 per cent. ferric chloride to 1 inch of freshly passed urine in a test-tube. At first a precipitate of ferric phosphate appears. Continue to add ferric chloride, the phosphate will dissolve and a port-wine colour appears if diacetic acid is present.

###### *Rothera's Test.*

Into a test-tube pour 1 inch of urine. Add to it 1 inch of ammonium sulphate crystals and shake. Add 2 drops of a freshly prepared weak sodium nitro prusside and 1 inch of concentrated ammonia. A permanganate colour develops in the presence of diacetic acid.

##### *ii. Acetone.*

###### *Rothera's Test.*

## 6.—Examine the Deposit.

The deposit may consist of—

Urates—disappear on boiling.

Phosphates—disappear on adding dilute acetic acid.

Uric acid—resembles cayenne pepper grains, lying at the bottom of the specimen glass.

Mucus—no importance. Filter urine to get rid of.

Red blood cells—microscope. If present in large numbers a red deposit colouring the supernatant urine reddish-brown or yellow.

Pus cells.

To test for pus, to the deposit add an equal quantity of liquor potasse and shake. If pus is present the mixture will become thick and ropy.

Another test is to add ozonic ether to the deposit, and if pus is present bubbling will take place.

**Douching.**—The method of giving a douche is described on page 267.

Whether the patient should be douched or not, will, of course, rest with the doctor. Unless the patient is bleeding, or has an offensive discharge, it is best to dispense with this treatment and to swab instead the operation site and its immediate neighbourhood with a solution of iodine and rectified spirit.

**Bath—Shaving—Preparation of the Skin.**—See pages 348 to 352.

**Bowels.**—*Minor and Major Operations.*—Two nights before the operation an efficient aperient should be given to the patient, so that her bowels may act thoroughly. Some surgeons prefer castor oil, others some such mixture as the following which is very efficacious:—

|                               |           |
|-------------------------------|-----------|
| Sulphate of magnesia . . . .  | 4 drachms |
| Sulphate of soda . . . .      | 1 drachm  |
| Extract of liquorice . . . .  | 20 grains |
| Essence of peppermint . . . . | 10 minims |
| Infusion of senna to . . . .  | 2 ounces  |

If the operation is of an urgent nature and there has not been time to give the aperient as described, an enema should be given, if possible, four hours before the operation.

**Bladder.**—*Operations on the Vulva, Vagina, Cervix.*—The patient is directed to pass her urine just before she is taken into the operating room.

*Abdominal Operations.*—For abdominal operations it is most important that the catheter should be passed *just before the operation*, since if the bladder is not empty there is danger of the operator cutting into it owing to its distended condition ; moreover, the full bladder will obscure the field of operation.

In some cases a fibroid or ovarian tumour will so press on the urethra that the nurse may have great difficulty in passing the catheter, which should be of rubber and not of glass, and, if so, she should always inform the operator of her difficulty, since it often transpires that she has been unable to empty the bladder.

In the radical operation for carcinoma of the cervix, the surgeon will probably pack the vagina with gauze soaked in some antiseptic solution after the patient is anæsthetized and on the operating table. In this case the bladder should be catheterized just before the packing is inserted.

**Dress.**—The patient should be dressed in a clean night-gown and flannel dressing-jacket ; she should have long woollen stockings reaching well up the thighs, and in addition, if possible, a jacket of gamgee tissue well covering the chest and which can be made by the nurse beforehand. Her hair should be done up in two plaits, and if she has any false teeth these should be removed before she is placed on the operating table.

**Food.**—If the operation is to be at 9 a.m., at 5 a.m. the patient is given a cup of tea and a rusk and butter. If the operation is to be at 2 p.m., then the tea and food is given at 10 a.m. The condition of the patient will be the guide as to what food she should be given, prior to the operation, for instance, whether, on account of weakness, stimulants and extra feeding will be necessary.



## CHAPTER XXXI.

### THE ASEPTIC TECHNIQUE.

THE technique of aseptic surgery is based upon the principle of preventing the infection of wounds by bacteria. The word aseptic means freedom from septic bacteria and their spores.

Such a technique can be perfect only if the case is a clean one, that is, if the operation area is not already infected and if everything that comes into contact with the wounded surfaces is sterile.

In a clean case, however, and with due care, the aseptic technique can be carried out in its entirety, with the exception of the sterilization of the skin. It is most difficult to sterilize the skin, and although, if the skin of the operation area is properly prepared, the danger of wound infection from this source will be very slight, nevertheless it must be admitted that it may be impossible to destroy all the bacteria which may have penetrated the sebaceous or fat glands of the skin without using chemical antiseptics of such a strength that the tissues would be injured.

The aseptic technique will be discussed under the following headings :—

In Hospital,  
In a Private House.

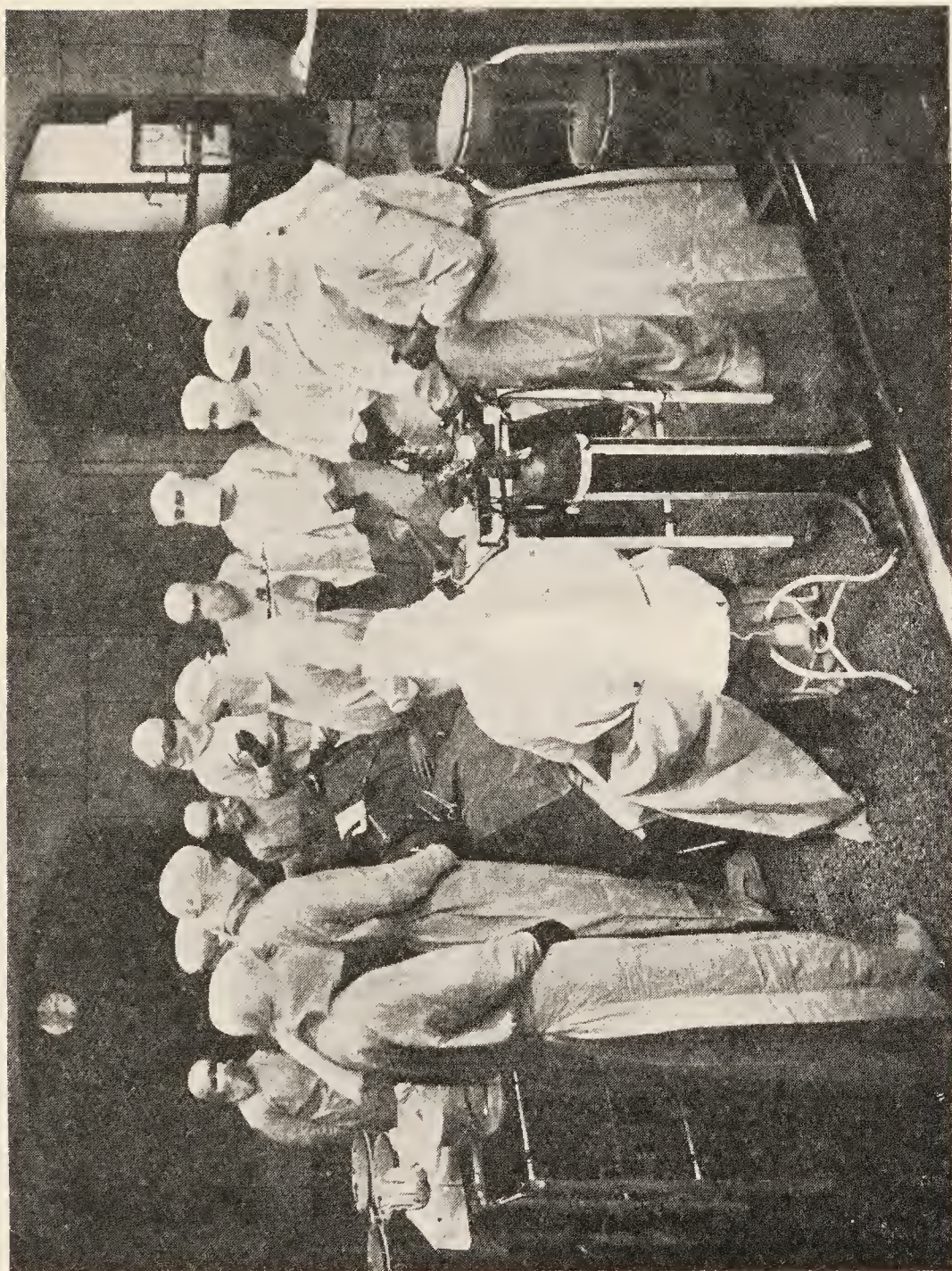
### ASEPTIC TECHNIQUE FOR OPERATIONS IN HOSPITAL.

The directions and rules given under this heading are, in the main, those followed at the Middlesex Hospital.



[Copyright, Wellcome Historical Medical Museum.  
FIG. 47.—A SURGEON'S OPERATING ROOM, 1690.





[Copyright, Wellcome Historical Medical Museum.]

FIG. 48.—A MODERN OPERATING THEATRE.

Surgeon, house surgeon, anaesthetist, dressers, theatre sister, ward sister, theatre nurse.



The following subjects will be considered :—

1. The operating theatre and its furniture.
2. The preparation of instruments, ligatures, rubber gloves, sutures, saline solution, swabs, dabs, and dressings.
3. The preparation of the hands of the nurses.
4. The clothing of the theatre and ward sisters and of the theatre nurse.
5. The duties of the theatre sister.
6. The duties of the theatre nurse.
7. The duties of the ward sister.
8. Surgically cleaning the patient's skin, and preparation of the operation site.

### THE OPERATING THEATRE AND ITS FURNITURE.

1. The theatre floor is scrubbed, and the furniture, which is chromium plated, is washed over with methylated spirit. Other furniture is carbolized with a solution of 1 in 20 carbolic acid before operations.

2. The electric light fittings are kept as free from dust as possible, and the shades of the lights over the operating table are washed daily.

3. The doors of the theatre and anæsthetizing rooms and the windows are kept closed during the operations.

4. The sinks and wash-basins, both inside and out, and the walls behind them are cleaned every day.

5. The waste-pipes in connexion with the sinks and basins are cleaned with a brush.

6. The theatre walls are swept down every day, and every six weeks the whole surface of the walls is washed by the hospital porters.

7. The instrument and bowl sterilizers are scrubbed every day with soda and water.

8. The articles of furniture used for the operation are :—

An operating table.

An instrument table.

A swab or dab table.

One or two dressing tables.

Two bowls or tripods for hand lotions.  
A stand for bowls if wet swabs are used.  
A surgeon's stool, if necessary.  
An anæsthetist's table.  
An anæsthetist's stool.

9. The position in which such furniture is placed varies with the choice of the individual surgeon.

A reference to Figs. 68 and 69 shows the positions used by the author for major and minor operations respectively.

10. The theatre floor in the neighbourhood of the operating table, and also any tables or tripods, if they have been soiled, are swabbed down between each operation.

### **Preparation of the Instruments, Ligatures, Sutures, Rubber Gloves, Saline Solution, Swabs, Dabs, and Dressings.**

#### **Instruments.—**

1. All instruments to be used, except the needles, knives, and scissors, are boiled twenty minutes before each operation, a pinch of bicarbonate of soda being added to the water. The lid of the sterilizer is kept closed while the instruments are being boiled.

2. The needles, knives, and scissors are placed in pure lysol and rinsed in methylated spirit before being used.

3. The same knife is never used for more than one case, after which it is boiled for three minutes and sent away to be resharpened. The scissors and needles are replaced in pure lysol and rinsed in methylated spirit after use.

4. All instruments are thoroughly cleaned with cold water and a nail-brush after use and before they are again boiled. Special care is paid to all the serrations and locks. The flushing curette is sluiced by holding the hole in its handle under fast cold running water from the tap, after this it is boiled and some Rangoon oil is lastly run through it to prevent rusting.

5. All porringers, dishes, and receivers are sterilized by boiling, after which they are placed on a table and covered with sterilized towels,

6. The nail-brushes used by the surgeons, students, and nurses are boiled daily, and placed before use in a bowl of weak lysol solution, or mercurial solution.

7. All instruments, except the needles, knives, and scissors, which have been used during the twenty-four hours are boiled for twenty minutes before being put away in the instrument case, in addition to the twenty minutes they have been boiled for the operation in which they were used.

8. Rubber tubing is boiled for twenty minutes and afterwards kept in a solution of 1 in 60 carbolic acid. When required, the tubing is removed direct from the glass-stoppered jar with a pair of sterilized forceps. Any portion that is not used, is boiled for ten minutes before it is returned to the jar.

### **Ligatures and Sutures.—**

1. The silk or thread is boiled for three-quarters of an hour and is used fresh for each case.

2. Silkworm gut is boiled for thirty minutes and then kept in a solution of 1 in 60 carbolic acid.

3. Catgut already prepared and put up in sealed glass tubes is used. The tubes are covered with wool and then completely immersed in a bowl of 1 in 1000 perchloride of mercury for thirty minutes before use.

### **Rubber Gloves.—**

1. The gloves are either sterilized by the high-pressure sterilizer or boiled for twenty minutes and, if the latter, are then placed in whatever lotion the surgeon directs.

2. After their removal the gloves are well soaked in cold water and then washed inside and out with soap and water and are examined for punctures.

3. After being washed the gloves are boiled for seven minutes, then well dried and powdered with talcum powder.

### **CAUTION.**

Rubber gloves are worn to protect the patient and not the nurse.



All punctures should, therefore, be mended, or failing this, the gloves should be discarded.

### Normal Saline.—

1. Concentrated saline solution is kept in a stoppered Winchester quart, and is of such a strength that 1 ounce of the solution to a pint of water makes a normal saline solution.

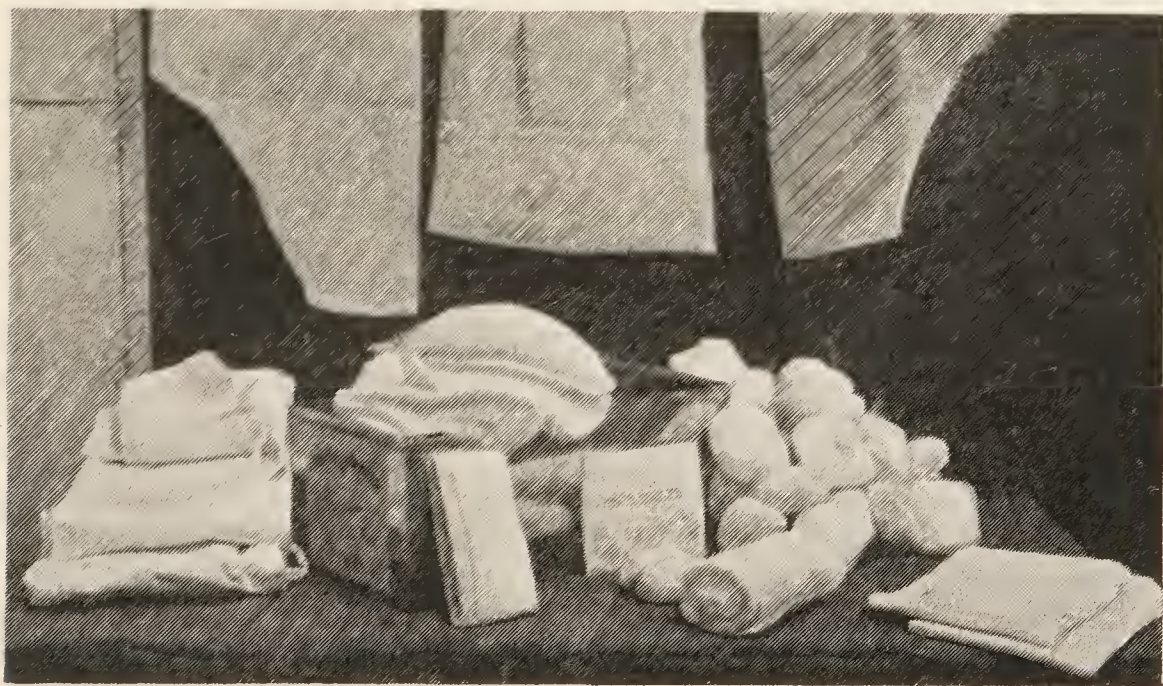


FIG. 49.—MINOR OPERATING TIN OF STERILIZED DABS, DRESSINGS, AND CLOTHING AS PUT UP FOR THE AUTHOR BY MESSRS. BELL & CROYDEN.

Showing leggings, perineal cover, overalls, masks, towels, dabs, tampons, T bandage, dressings.

2. Each day a certain amount of normal saline solution is prepared and is then boiled for twenty minutes and stored in sterilized bottles.

3. The normal saline solution, when required, is poured straight into a sterilized porringer or jug, as the case may be. At the end of the day if any of the solution is left in the bottle it is added to the next day's supply and boiled with it.

**Dabs.—**

These are made of absorbent cotton-wool wrung out of a solution of perchloride of mercury (1 in 2000). Dabs will be needed for minor operations upon the vulva, vagina, and cervix. The number required will depend rather on the nature of the operation. Three dozen will probably be sufficient for any case, and if any are left over they can be used later when dressing the patient. Some surgeons prefer pieces of gauze folded in four about six inches square. In many cases such dabs are more convenient to use but their cost is much greater.

Dabs, especially when used in the form of gauze, are a heavy item of expenditure in hospital finance. This expense can be greatly reduced, and the efficiency of the dab increased, by using Turkish towelling cut to the same size as the gauze dabs, and properly hemmed. Such dabs can be used over and over again, being sent to the wash and sterilized on their return. The same material can be used for the smaller swabs.

**Swabs.—**

For abdominal and vaginal sections the swabs are made as follows :—

Some gamgee tissue is cut into square pieces, after which their edges are tucked in and sewn. Two sizes should be made,  $12 \times 12$  inches and  $6 \times 6$  inches. As a rule 12 swabs will be quite sufficient for most operations, two  $12 \times 12$  inches and ten  $6 \times 6$  inches. In many cases not half this number will be used. The squares are sewn together like a mattress. They are sterilized in the high-pressure sterilizer. Some surgeons use squares of muslin only, in which case there must be eight layers sewn together in a similar way to those made of gamgee.

As gamgee is expensive, swabs serving the same purpose can be made by enclosing a layer of absorbent wool between muslin.

**Dressings.—**

*Perineorrhaphy and Colporrhaphy.*—Some surgeons insert a piece of sterilized gauze into the vagina to act as a drain ;



this is removed the morning following the operation ; another piece is placed over the stitches, and this is kept in place by a pad of absorbent wool and T bandage.

*Excision of Bartholin's Cyst, Cancer of Vulva.*—A piece of cyanide or plain sterilized gauze is placed over the parts, and then a pad of absorbent wool, which is kept in place by a T bandage.

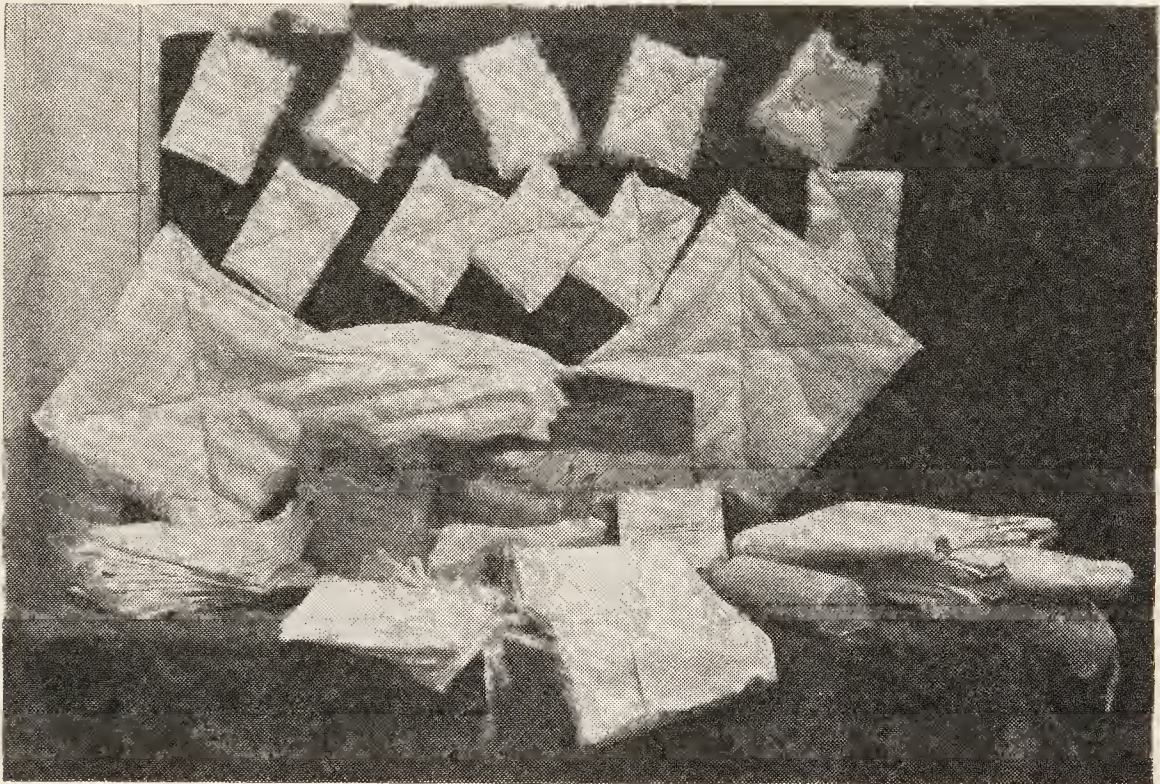


FIG. 50.—MAJOR OPERATING TIN OF STERILIZED SWABS, DRESSINGS, AND CLOTHING AS PUT UP FOR THE AUTHOR BY MESSRS. BELL & CROYDEN.

Showing 10 small swabs, 2 large swabs, overalls, masks, body cover, towels, dressings, many-tailed bandage.

*Curettage.*—A gauze drain is inserted into the vagina, and in some cases the operator may wish, in addition, if there is undue bleeding, to pack the uterus with gauze. In this case he will require the gauze, which should be ready and suitably protected, to be handed to him in a long continuous strip about 2 inches broad. Some surgeons prefer not to insert any dressing into the vagina. A pad of absorbent wool and a T bandage then completes the dressing.



*Excision of Vaginal Cyst or Tumours.*—Unless there is any troublesome oozing (when the vagina can be packed for a few hours with gauze or tampons), a pad of absorbent cotton-wool and T bandage is all that will be necessary.

*Operations on the Cervix.*—As for operations on the vagina.

*Vaginal Hysterectomy.*—As a rule, most surgeons insert a small quantity of sterilized gauze, which acts as a drain through an opening at the top of the vagina into the pouch of Douglas.

*Abdominal Section.*—The wound is dressed with dry dressing, consisting of gauze, absorbent wool, and a many-tailed binder. Rarely, consequent on some oozing of blood or escape of pus, the operator may wish to drain the pelvis, in which case he will require a drainage tube. A safety-pin which has been boiled will be required to prevent the drainage tube slipping into the abdominal cavity.

The patient should be measured for the binder prior to the day of the operation, in order that it may fit nicely. The author has not for many years used any dressing or binders after abdominal operations, unless the pelvis has been drained. The wound of the abdominal incision heals just as well without any dressing, and patients who have had two abdominal operations, and for the first had dressings and the second none, assert that they are more comfortable without any dressing. This method results in the saving of great expense to a hospital in which a large number of abdominal operations are performed during the year.

If the patient is very sick following the operation it is advisable to adjust some sort of abdominal binder till the attack is over.

### **Preparation of the Hands of the Nurse.**

Before helping in any way with the operation or in preparing the instruments, the hands should be thoroughly washed for a period of three minutes in running water.

The hands and forearms are scrubbed with a sterilized nail-brush and soap and water until a good lather is obtained, particular care being given to the nails and clefts between the

fingers. When a good lather is obtained, the washing is continued with plenty of soap and hot running water.

If gloves are going to be worn the soap is removed with the running water and the gloves are then applied as directed. If, as in the case of the theatre nurse, gloves are not being worn, the hands are dried on a sterilized towel, which should not be used again for a similar purpose.

### CAUTION.

1. All nurses working in the theatre should be quite healthy. Such conditions as carious teeth, sore throats, or septic wounds of the fingers are especially dangerous.

2. Rough skin harbours microbes to a much greater extent than smooth skin. It is possible to keep the hands smooth by not dipping them into too strong an antiseptic solution or by avoiding those antiseptics which experience proves do not agree with the skin of the particular person concerned. In addition, after the nurse has finished her work and her hands have been well dried, a little diluted glycerine should be rubbed into them.

3. The nails should never be cleaned by scraping them with a knife, nail-cleaner, or pair of scissors. They should be kept short enough to allow of their being effectively cleaned with the nail-brush.

4. Pus should not be touched with the bare fingers, and dirty dressings should be removed with dressing forceps.

5. All rings should be removed, even if one happens to be a wedding ring. Hospital nurses do not, as a rule, wear rings when on duty, but private nurses have been known to do so.

### Clothing of the Theatre Sister, Ward Sister, and Theatre Nurse.

#### Overalls, Veils, and Footwear.—

1. The theatre and ward sisters and theatre nurse wear clean linen dresses, the sleeves of which can be rolled up above the elbows.

2. The theatre and ward sisters and theatre nurse wear sterilized overalls, and veils also if the surgeon elects to wear one. Other nurses on duty in the theatre wear sterilized overalls and masks.

3. The overalls are, before being sterilized, so folded that the surface which will be in contact with the body is outermost.

4. After the overall has been taken from the tin by the person who is going to wear it, it is held so that it becomes unfolded and the arms are then slipped into the sleeves and held out straight in front.

5. The theatre nurse adjusts the overall of the theatre and ward sisters by pulling it into place by means of its tapes which are then tied. The clothes at the back should be completely covered. She also adjusts the veil, which should cover the nose.

6. Some surgeons require nurses to wear overalls, made of calico or some other material, over their shoes and reaching up their legs to their knees, where they are tied with a tape.

7. In some hospitals the theatre nursing staff wear india-rubber boots.

### Rubber Gloves.—

1. To put on a rubber glove that has been boiled it should first be emptied of the boiling water that remains in it after removal from the sterilizer, otherwise the hands may be badly scalded. It should then be filled with the lotion in which it was placed, and held with the fingers pointing downward and away from the bowl of lotion, over a dish or another bowl.

2. The hand corresponding to the glove should now be passed into the glove and, as it displaces the lotion, the hand should be raised and the lotion allowed to escape into the sink or bowl and not over the glove.

3. The cuff of the glove should then be pulled over the cuff of the overall so that the hand, wrist, and arm are covered entirely with sterilized articles (Fig. 51).

4. After the operation the gloves should be well washed with cold water before they are removed.

5. A rubber glove is best removed by raising the cuff of the glove, allowing a little water to enter, and then pulling on





FIG. 51.—NURSE PROPERLY CLOTHED FOR ASSISTING AT AN OPERATION.

See that the veil covers the nose, and that the ends of the sleeves of the overall are covered by the cuffs of the rubber gloves.



the cuff so that the glove is turned inside out. There is much less risk of tearing the glove by this method, than that so often employed by nurses of pulling off the glove in its soiled state.

Many surgeons require methylated spirit, or a solution of biniodide of mercury and spirit, to dehydrate their hands before putting on the gloves.

If rubber gloves sterilized by the dry method are being used, the hands should be dried with a sterilized towel first, after which they should be powdered with sterilized talcum powder applied with a piece of sterilized gauze.

Dry sterilization destroys india-rubber gloves much more quickly than boiling them.

### CAUTION.

Do not try to eradicate any creases in the fingers of the glove which has been drawn on, by smoothing them out with the bare fingers of the other hand, as by doing so the glove may be infected.

With a little practice the gloves can be drawn on quite easily without causing any creases. If the latter are present, they must be smoothed out by the gloved fingers of the other hand, or if the tips of the glove fingers are projecting in a collapsed condition beyond the fingers of the hand, the glove should be removed and reapplied. Some nurses and also doctors appear to have an insuperable difficulty in putting on the rubber gloves by the method described. If such is the case an alternative method is to smear a little ether soap over the hands first.

### The Duties of the Theatre Sister.

1. The nature of the instruments to be used and their number should be most carefully noted, and it is better to make a list for each operation. Such information is necessary because at the end of the operation the surgeon will ask whether the instruments are correct.

To avoid the necessity of another instrument having to be

fetched while the operation is in progress, the sister should, if she does not know for certain, ascertain from the surgeon or house surgeon what instruments will be required.

2. Having prepared her hands, and put on her overall, veil, and gloves, she should, during the operation, touch only those articles which have been sterilized.

3. She should cover the instrument table with a sterilized towel.

4. The instruments, sutures, and ligatures having been transferred from the sterilizer by the theatre nurse, the theatre sister should arrange them in the operating tray, or on the instrument table, according to the wishes of the surgeon, and should then cover them with a sterile towel.

5. All sutures and ligatures should, while being cut, be touched, as far as possible, with sterilized forceps only, and should be covered with a sterilized towel during the operation. When the catgut is required, the theatre sister should remove the tube from the antiseptic with a sterilized towel and break the tube in this.

6. Unless otherwise directed the average length for a ligature is 18 inches, for a mattress suture 12 inches, and for a continuous suture 24 inches.

7. If there is more than one operation the theatre sister should assemble the instruments for the next operation before the previous one is commenced, or, if it is the duty of the theatre nurse to do this, the theatre sister should check the instruments and their number. By doing so, the instruments for the next operation can be sterilized during the progress of the one about to be performed.

8. At the termination of one operation the theatre sister should remove her gloves, wash her hands, and assemble the instruments for another operation if necessary, as noted in paragraph 7. She should then wash her hands again, and put on a fresh sterilized overall and a pair of sterilized gloves, preparatory to arranging the sterilized instruments for the next operation.

9. She should sign her name in the anæsthetic book against the entry of every abdominal operation performed.



## CAUTION.

The theatre sister should never fetch any new instrument herself but should direct the theatre nurse to do so.

If a tray is used for the ligatures and sutures, care should

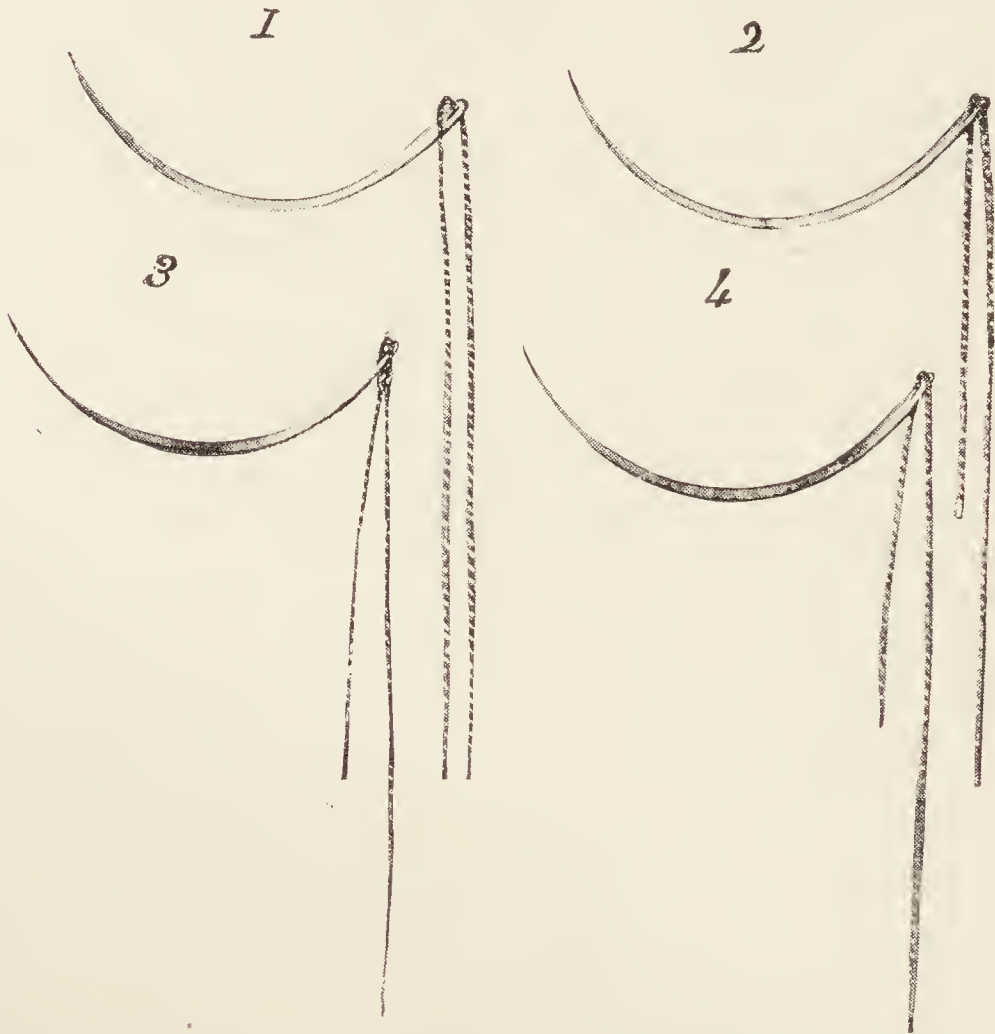


FIG. 52.—CORRECT AND INCORRECT METHODS OF THREADING THE NEEDLE WITH MATTRESS AND CONTINUOUS SUTURES.

*Mattress Suture :—*

1. Incorrect, both ends the same length.
2. Correct, one end longer than the other.

*Continuous Suture :—*

3. Correct, tied in with one knot.
4. Incorrect, not tied in.

be taken when cutting them off not to let them touch the edge of the tray. If a tray is not used, they must not be allowed to touch the edge of the table. Ligatures and sutures should

be handed straight to the operator without allowing them to touch anything but sterilized instruments or gloves.

Sutures or ligatures must never be drawn through the fingers to straighten them or to estimate their length, as this increases their chance of being infected. If they happen to be curled, they should be straightened by pulling on each end.

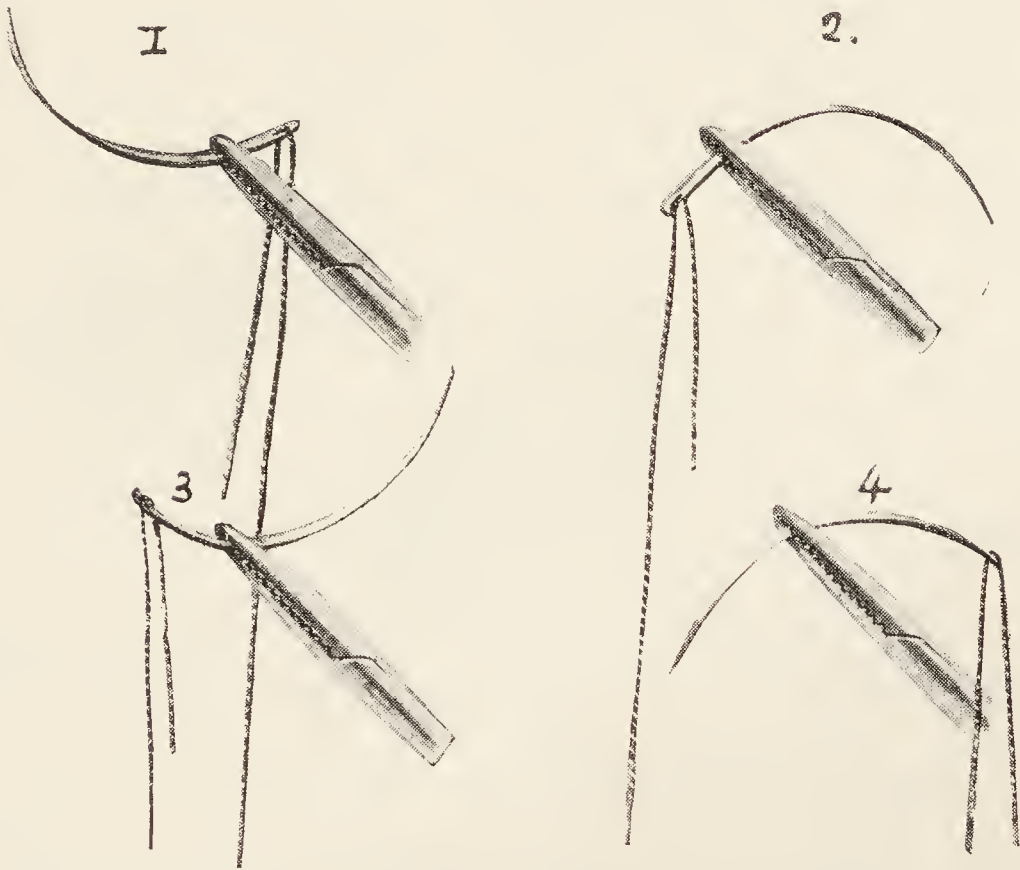


FIG. 53.—CORRECT AND INCORRECT METHODS OF FIXING A THREADED NEEDLE IN A NEEDLE-HOLDER OR PRESSURE FORCEPS.

1. Correct—the sharp point of the needle pointing upwards and towards the surgeon.
- 2, 3, and 4. Incorrect.

A mattress suture should not be tied in the needle, and one end should be left longer than the other when the needle is threaded. Fig. 52 (1 and 2).

A continuous suture should always be tied in the needle with one knot, leaving one end short, about 2 inches. Fig. 52 (3 and 4).

There is a right way and a wrong way of fixing a threaded needle in a needle-holder or pressure forceps (Fig. 53), and of handing it to the operator (Fig. 54). The surgeon prefers the right way, and yet in spite of their training a large number of nurses, especially when acting as instrument nurse at operations outside the precincts of a hospital, will insist on threading the sutures and handing the needles to the surgeon incorrectly. This shows great lack of observation even if not carelessness.

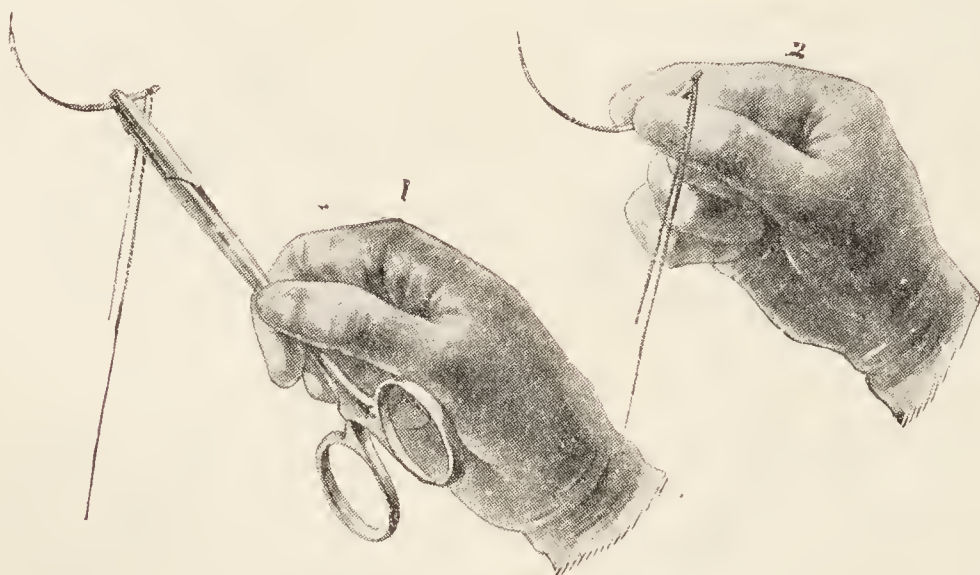


FIG. 54.—CORRECT METHOD OF HANDING THREADED NEEDLE TO THE SURGEON.

1. In pressure forceps, so that the surgeon can take hold of the end of the forceps.
2. With the fingers, so that the surgeon can grasp the needle with the pressure forceps.

If the number of instruments or swabs used have not been carefully noted a wrong answer may be given to the surgeon when he inquires if the number is correct, with the result that an instrument or swab may be left in the abdomen.

Those surgeons who use slot needles (Reverdin's or some modification thereof) will not require the ordinary needles or the theatre sister to thread the needle. In this case as regards the sutures all the theatre sister has to do is to hand the correct length of suture to the house surgeon or assistant. The correct position for the theatre sister is then at the bottom of



the operating table opposite the knees of the patient when she will be able easily to pass over the suture. In this case she will find it more convenient to stand on a platform and have an instrument table that can be raised to a comfortable height. In the absence of such a platform and table she must place her instrument table on the right-hand side of the surgeon so as to be able to hand him easily and quickly, sutures, ligatures, and instruments. In addition she will find it convenient, and add to the perfection of the operation technique, if she cuts the sutures and ligatures the desired length before sterilizing them, keeping them thereafter in a sterilized towel, or better still, threading them through a glass tube first and then sterilizing this.

Lastly some surgeons use wristlets for their sutures and ligatures, in which case beyond preparing them and their receptacles, the theatre sister will not have any further duties in respect of these.

### **The Duties of the Theatre Nurse.**

In many large hospitals there are two theatre nurses, in which case the duties, as here outlined, will be divided.

The theatre nurse helps the theatre and ward sisters during the operation in any way they require and thus prevents them infecting their gloved hands.

In addition :—

1. She should arrange the necessary furniture in its proper position.

2. She should prepare the lotion for the hands, being careful that its strength is correct, and its temperature not too high.

3. She should wheel the instrument table, the top of which is covered with a sterilized towel, by its legs to the sterilizer. She should then with a pair of forceps, previously sterilized and kept in a sterilized or antiseptic solution, remove the instruments, etc., from the sterilizer, into the instrument tray or on to the instrument table as the case may be.

Alternatively the theatre sister can thus transfer the instruments, or the instrument table being placed in the position it will occupy during the operation, the theatre nurse can lift

the wire tray from the sterilizer, carry it to the instrument table, and turn out the instruments on to it.

4. When the patient has been lifted on to the operating table, the theatre nurse should place her in position as follows : The night-gown is drawn up to a level with the chest and the blanket well below the pubes. The arms of the patient are then securely fixed by her side as follows, either by the special arm holder of Patterson, which is the best way, or by arranging the arms of the patient straight along her sides under the macintosh, the palms of her hands in apposition with the table and slightly beneath her buttocks.

### **Trendelenburg Position.—**

If the surgeon wishes the patient to be placed in the Trendelenburg position, before the anæsthetist tilts the table, the legs or ankles must be securely fixed with straps or bandages to the flap of the table which is at the end and projecting at right angles to the rest of the table (see p. 362).

After the patient is tilted to the correct angle the theatre nurse should adjust the knee-instrument table devised by Victor Bonney, should the surgeon elect to use it.

### **Lithotomy Position.—**

The best way to bring the patient into the lithotomy position is for the theatre nurse to stand at the bottom of the table, and then, with one hand under each buttock of the patient, to lift her down so that the patient's buttocks project well over the end of the table. The anæsthetist, or his clerk, can render valuable help by pushing the shoulders of the patient at the same time.

5. She should then, if the surgeon wishes it, paint the skin of the operation site with the iodine solution, or the house surgeon does so.

6. She should next open the tin containing the sterilized body-cover and towels, if the operation is an abdominal one ; or the sterilized leggings, the perineal cover, and towels if the operation requires a lithotomy position, so that the theatre sister can gain access to these articles without infecting her hands with the outside of the tin.



7. If during the operation a new instrument is required, she should take it from the instrument case, sterilize it, and then hand it with sterilized forceps, or in the wire tray of the sterilizer, to the theatre sister.

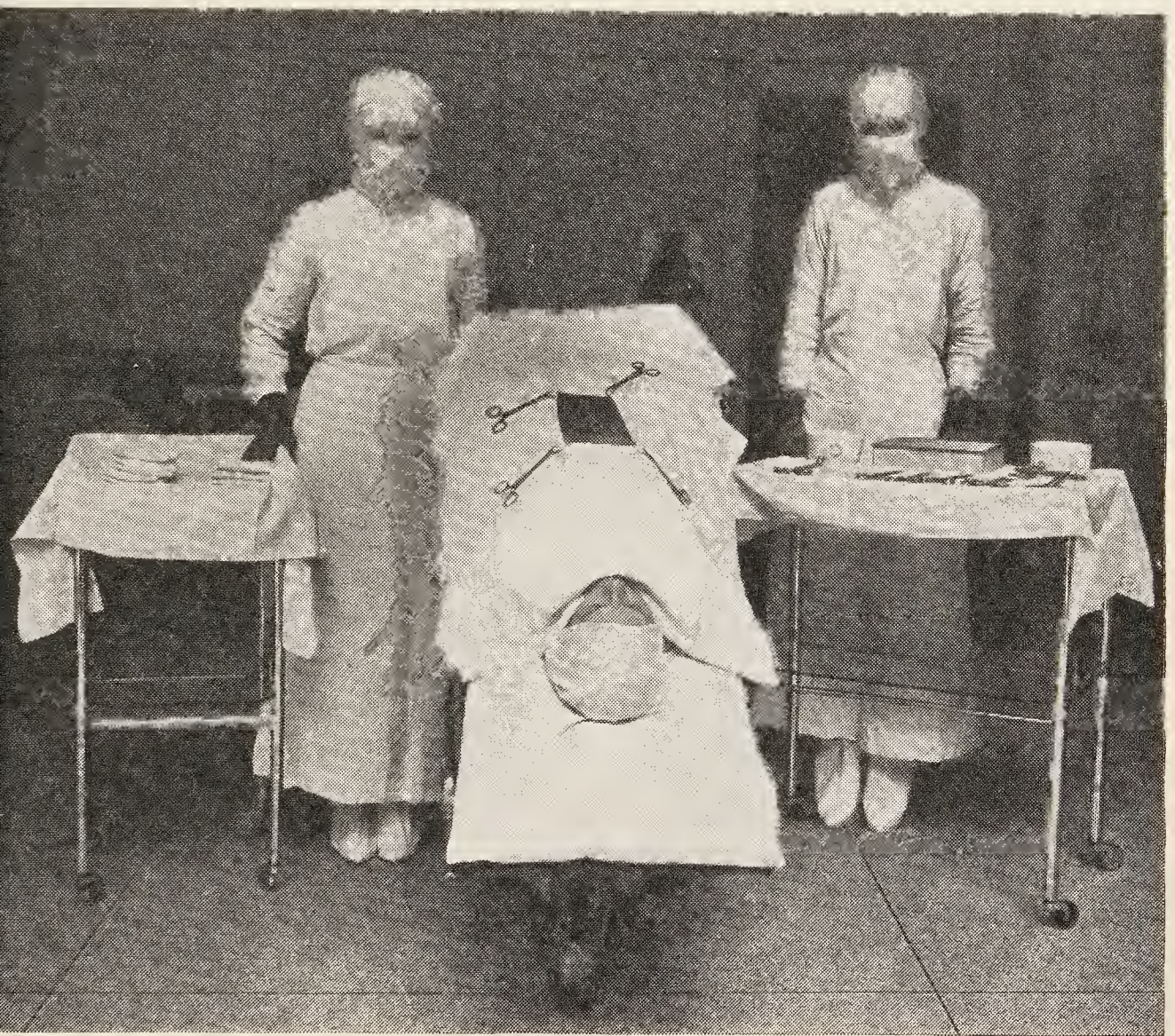


FIG. 55.—TRENDLENBURG POSITION.

Showing the theatre sister and ward sister and the instrument table and swab table in their proper positions. The patient is tilted into the Trendelenburg position and the sterilized body cover and knee table is in place.

8. If during the operation the surgeon requires a porringer or normal saline solution, she should take one of the porringers



or jugs already sterilized and hand it in a sterilized towel. A small porringer or jug should always be carried by placing



FIG. 56.—LITHOTOMY POSITION.

Showing the theatre sister and ward sister and the instrument table and swab table in their proper positions. The patient is in the lithotomy position with the buttocks well over the end of the table and projecting over the tray. The sterilized leggings, perineal cover, and towel over tray are in place.

the hand outside and then separating the fingers and thumb, and not with the help of the thumb inside the article and the hand and fingers outside.



9. She should not touch anything that has been sterilized, unless so directed, without holding it in a pair of sterilized forceps or in a sterilized towel.

10. At the close of the operation she should hand the tin of sterilized dressings to the surgeon, house surgeon, or theatre sister as the case may be, having first opened the lid.

11. If the instruments which have already been used are required again during the afternoon for another operation, she should clean them.

12. She should have the necessary articles ready for catheterizing the patient during the operation. If the surgeon wishes this to be done, she should be prepared to pass the catheter if requested. Before, therefore, undertaking the post of theatre nurse, she should make herself thoroughly acquainted with the proper method of passing the catheter and of the site of the urethral meatus. Nothing is so exasperating to a surgeon as a nurse bungling in her attempts to empty the bladder during the course of an abdominal operation.

13. At the close of the operation she should arrange the clothes of the patient in a suitable manner, and cover the patient with a blanket prior to her removal from the theatre. She should also place a porringer and towel near the face of the patient in case she vomits.

### CAUTION.

If the antiseptic in the lotion for the hands or gloves is too strong or is not mixed properly, the hands of anyone using it may suffer. This is particularly likely to happen if the surgeon uses a lotion containing carbolic acid, which may have been prepared of such a strength that it will anæsthetize his fingers. Also if, when the pure carbolic is added to the water, the solution is not thoroughly mixed, some of the chemical will accumulate at the bottom of the lotion bowl, and when the hands are placed in the lotion they may be badly burnt or blistered, an occurrence which the surgeon is never likely to forget and will certainly not excuse.

If the lotion is made too hot the hands of the surgeon may easily be scalded. The temperature of the lotion should be

taken with a thermometer and should be about 100° F. It is notorious that nurses can place their hands, with impunity, in water at a temperature which would make the surgeon jump if nothing more. In judging the proper temperature of the lotion for the hands, therefore, nurses must not be guided entirely by one which they themselves can tolerate.

The theatre nurse should be very careful not to drop any articles on to the floor. The noise occasioned by the dropping of a bowl or porringer, for instance, is apt to annoy the surgeon considerably and the theatre sister especially.

Instruments or swabs dropped on the floor should not be removed until after the counting, unless the instrument happens to be one which cannot be dispensed with, when it should be re-sterilized.

### The Duties of the Ward Sister.

1. The theatre nurse having opened the tin containing the sterilized towels and body-cover, or the sterilized towels, leggings, and perineal cover, the ward sister should, with the aid of the house surgeon or dresser, arrange these articles appropriately on the patient.

2. The ward sister, having covered the swab table with a sterilized towel, should remove the sterilized swabs or dabs from the tin, which has been handed to her by the theatre nurse with the lid open, and place them on the swab table, counting them very carefully as she does so. Some surgeons prefer the swabs to be taken direct from the tin by the house surgeon or ward sister as required.

She should use a different and newly opened tin containing sterilized swabs and dressings for each patient.

3. Although the ward sister is not personally responsible for the number of swabs used in a major operation, nevertheless, she should always know exactly how many have been used.

Stitched swabs should be of standard size, 6 inches and 12 inches, the 6-inch swabs being fastened in bundles of six. Some surgeons prefer the 6-inch and 12-inch swabs to have a tape 12 inches long attached to the corner of the swabs. When the bundles of 6-inch swabs are untied their number



should be audibly counted out and the number entered on a slate. The number of stitched swabs put out on the table should be checked by the ward sister, or her deputy, and by the theatre sister, or her deputy, both at the commencement and termination of the operation. When both sisters are satisfied that the number is correct, the ward sister informs the surgeon. Alternatively the surgeon may ask the theatre or ward sister at the end of the operation if the number of swabs is correct, and if he is wise he will ask this question both before he inserts the peritoneal suture and after the abdominal wound is closed.

Although theoretically he should count the swabs himself, he may practically take the sister's word for the number being correct.

4. Her further duties during the operation depend upon the wishes of the surgeon. Thus she may be directed to hand the swabs or dabs, to convey ligatures, sutures or instruments to the surgeon, or to help in the operation by holding an instrument or swabbing the wound.

5. At the close of the operation she may be directed to help in applying the dressing and in adjusting any bandages.

6. After the operation she should stay by the patient until the ward nurse, who has brought down the next case, is free to take over this duty.

7. She should sign her name in the anæsthetic book against the entry of every abdominal operation performed.

### CAUTION.

Never cut a swab in half. The fact that this has been done may be forgotten and half a swab consequently left in the abdominal cavity.

Always be certain that the correct number of swabs have been returned just before the abdominal cavity is closed.

Never allow any swabs to be removed from the operation room before the operation is completed.

Swabs and instruments are more likely to get lost in an emergency operation. It is a moot point who is really responsible for the number of swabs which have been used at

an operation. If the operation is in a nursing home, or private house, in the author's opinion the surgeon is responsible, and he should satisfy himself that the number of swabs is correct before he closes the abdominal wound. If the operation, however, is in a hospital in which there is a highly trained theatre sister and ward sister, perhaps of many years' experience, the surgeon is entitled to assume that the sisters will keep a safe count of the swabs. He may have had a series of operations during the afternoon, some of them very difficult and of an anxious nature, and he may well be excused having to accept the additional responsibility of ensuring that the number of swabs and instruments are correct. In fact this decision has been given in a Court of Law.

When assisting at an abdominal operation do not lean on the table, and during an operation with the patient in the lithotomy position do not lean against the patient, as by so doing the patient is tilted sideways.

Attend to your own duties and do not interfere or engage in conversation with other people unless absolutely necessary.

A chatty sister or nurse is an abomination.

**Preparation of the Operation Area.**—Before any operation the patient should be shaved over the operation area ; she should also have a bath, and should have the skin in the neighbourhood of the operation site suitably prepared. Whether or not she should in addition be given a vaginal douche depends upon the directions of the surgeon. If there is hæmorrhage or a discharge, douches twice daily before and on the morning of the operation will probably be ordered, otherwise if the operation is on the vulva, vagina, or cervix the surgeon may direct that these parts be swabbed with the iodine or violet-green solution.

*Shaving.*—It is much better that the vulva should be shaved before all operations on the genital organs. It is impossible to sterilize the pubic hair ; therefore it is better removed. The points to remember in shaving are, first of all, to have a very sharp razor, a blunt razor is much more liable to cut the patient ; secondly, to lather well the part for some time, and thirdly, to dip the razor momentarily into boiling water before using it.

Undoubtedly the best kind of razor to use is a safety razor,

since with it a patient can be very closely shaved by the most inexperienced nurse, without any danger of being cut.

In some instances, especially when the patient is fat, the nurse will experience great difficulty in properly shaving the necessary area, and in such cases, this can be successfully accomplished either by placing a pillow in the hollow of the patient's back so that the pelvis is tilted or, better still, by making the patient kneel. When the shaving is finished any excess of soap and loose hairs are removed with swabs of absorbent wool, after which the patient has her bath.

*Bath.*—On the afternoon before the operation the patient, having been shaved, should have a hot bath of about 10 gallons of water, to which some surgeons like added 5 pints of a solution of carbolic acid (1 in 20), and she should well scrub and soap herself all over. The nurse should always ask the doctor whether he wishes this bath to be given, because it may be very dangerous for the patient to be moved out of the bed. Thus, in cases of extra-uterine gestation, when bleeding has taken place internally, or in acute inflammatory conditions of the pelvis the nurse must wash the patient in bed.

#### *Preparation of the Skin.*—

The manner and thoroughness with which this is carried out is of the greatest importance, since, if the skin is properly cleansed, not only will stitch abscess, a troublesome condition which often causes more distress and trouble than the original operation, be less common, but there will be less risk of the operator conveying any septic matter from the skin to the peritoneal cavity, and so infecting the patient with, on occasions, a resulting fatal peritonitis.

The patient having returned from her bath, is put to bed. Her nightdress is rolled up all round to her chest, and the bedclothes covering her are removed with the exception of a blanket which is turned down below the pubes.

As the cleansing of the abdomen will necessitate some exposure, the nurse must see that the temperature of the room is not below 65° F., that the doors are closed as well as any windows through which the wind will blow directly on the patient.



The nurse should then continue as follows :—

1. She should turn up the sleeves of her dress above the elbows.

2. She should collect all the materials she will require on a dressing trolley or table.

3. She should wash her hands thoroughly with soap, hot water, and a nail-brush.

4. She should spread sterilized towels round the part to be washed, and then continue as follows :—

5. Rub in ether soap until it is dry in order to obtain its penetrating action on the skin.

6. Scrub the skin gently but thoroughly with sterilized wool and hot sterilized water.

7. Remove the lather with a sterilized swab. Be careful to wipe the outer limits of the cleansed area last.

8. Thoroughly rub the cleansed skin with ether, or methylated spirit, on a sterile swab, removing any excess with another swab.

9. Spread sterilized lint over the area, seeing that the covering is adequate, and bandage firmly in position.

The area to be painted for an abdominal operation should be included between a line drawn across the body at the level of the epigastrium and one drawn across the thighs below the level of the vulva.

If, however, a body-cover is used an area of 12 inches square will be sufficient in most cases, and this is a consideration when violet-green is used, because of its staining properties.

10. The skin of the operation area may then be painted by one of the following solutions :—

### **Violet-Green Method.—**

For sterilizing the skin, this method has been proved, by bacteriological tests, to be the most efficacious of any ; the skin being sterile after treatment, whereas it is not with the iodine method. This method owes its superiority to the fact that the dye penetrates the superficial layers of skin as also the fat and sebaceous glands and hair-follicles, situations in which organisms are so commonly found, much more readily

than iodine used in such a strength, and for such a time, that the skin will not be injured.

The solution contains 1 per cent. of a mixture of equal parts of hexa- or penta-methyl violet and sulphate of zinc-free brilliant green, dissolved in equal parts of rectified spirit and water, the powder being dissolved in the spirit before the water is added. Six hours before the operation the solution is painted over the skin of the operation area four times, and a compress of lint soaked in the same solution diluted with an equal quantity of sterile water and covered by a piece of waterproof batiste is then applied and kept in position by a binder. For operations on the vulva the solution is used half strength before applying the compress, since irritation is caused in many cases when the full strength is used.

If the vagina has to be packed the solution is used half strength, and the packing is inserted just before the operation when the patient is under the anæsthetic.

The disadvantage of the violet-green method is that it stains any linen brought into contact with the dye, and the stain cannot be removed without somewhat affecting the fabric. The nurse should wear india-rubber gloves, the patient an old nightgown, and the painted area must be so protected that the bed linen is not stained. The dye can be removed from the skin by a solution of 1 per cent. hydrochloric acid in rectified spirit.

### **Iodine Method.—**

This method depends partly upon the power which alcohol possesses of penetrating the deeper portions of the skin. Skin that has recently been wet does not allow this penetration to take place to the same degree that obtains when the skin has previously been kept dry for some hours. If possible three or four hours should elapse between the patient's bath and the application of the iodine solution. The solution commonly employed is one of 2 or 3 per cent. iodine in rectified spirit. Two applications are required, one in the morning of the operation, and a second in the theatre; the solution should be fresh.

The nurse should—

Rub the part over three times with a clean swab soaked in ether. Apply the iodine with a sterile swab soaked in the iodine solution. Cover the part with dressing or a sterilized towel and keep this in position with a bandage.

In the theatre the dressing is removed and the theatre nurse should again apply the solution, unless the surgeon or house surgeon elects to do so.

Occasionally iodine causes much irritation of the skin and so annoyance to the patient.

### **Picric Acid Method.—**

Some surgeons prefer a solution of 5 per cent. picric acid in alcohol, in which case it is used in the same way as indicated under the iodine method.



## CHAPTER XXXII.

### SURGICAL INSTRUMENTS WHICH WILL PROBABLY BE REQUIRED FOR THE VARIOUS GYNÆCOLOGICAL OPERATIONS.

THE illustrations depicted in this chapter show, and the lists accompanying them enumerate, the surgical instruments which may be required for the performance of the various gynæcological operations. The sister who is responsible for the instruments, sutures, and ligatures must be guided by the special requirements of each individual surgeon. If, therefore, she does not know which particular instruments, or what variety of ligatures and sutures, the surgeon is in the habit of using for any special operation, the sister must ask him.

It is much better, in case of doubt, to prepare too many instruments than too few. The absence of some instrument which is required means a delay in the operation while the instrument is taken from the case and sterilized.

On the other hand, there is a distinct disadvantage in putting too many instruments out, since the chance of one of them getting mislaid is greater. There are many cases on record, and a vast number not on record, in which some instrument, such as a pair of dissecting or pressure forceps, a pair of scissors or a towel clip has been inadvertently left in the abdomen. Such an instrument has been recovered later by the operator having to re-open the abdomen, the fact that the instrument was missing being discovered only after he had closed it; by an X-ray examination of the patient; by its discharge through an abscess, or at a post-mortem examination. The sister must

be very careful, therefore, to count the instruments before the operation, at the close of the operation just before the peritoneum is sutured, so that she may be able to answer the question of the surgeon which he always should ask, "Is the number of the instruments correct?" and after the operation is over.

If any doubt arises subsequent to the patient leaving the operating theatre, and if the necessary apparatus is available, an X-ray examination of the abdomen will settle the matter.

For sutures and ligatures the author uses plaited silk and iodine tanned 30-day catgut, put up in hermetically sealed glass tubes.

It is found by experience that 20 yards of No. 4 silk and 6 yards of No. 2 silk are, as a rule, more than sufficient for any major operation of a gynæcological nature. Many surgeons use catgut entirely.

Rubber gloves will be required for the surgeon, house surgeon, dressers, the instrument sister, and ward sister.

For the meaning of the names of the various operations the nurse is referred to the Glossary.

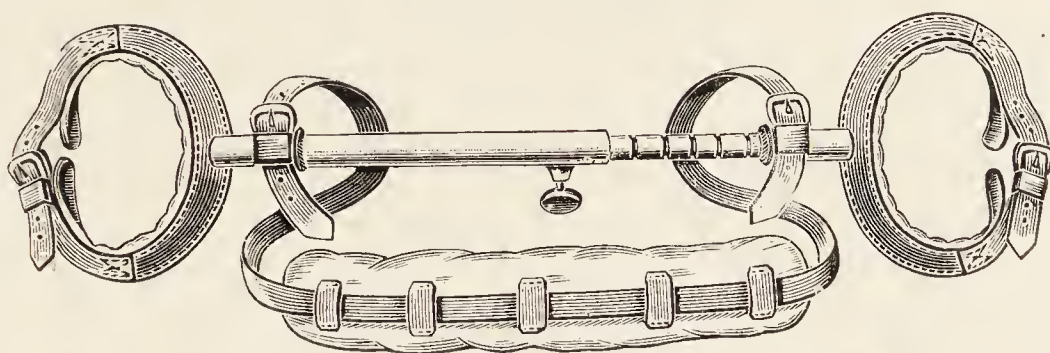
### Vulval and Vaginal Cysts. (Fig. 57.)

- |                              |                                 |
|------------------------------|---------------------------------|
| A. Clover's crutch.          | J. Catheter.                    |
| B. 6 Short pressure forceps. | K. Scalpel.                     |
| C. 2 Scissors.               | L. Auvard's speculum.           |
| D. Vaginal retractor.        | M. 2 No. 5 half-circle needles. |
| E, F. 2 Dissecting forceps,  | N. 2 No. 9 " "                  |
| long and short.              | O. Bladder sound.               |
| G. 2 Ring forceps.           | P. 2 Tubes catgut, No. 2.       |
| H. 4 Spring clips.           | Q. Gloves, 4 pairs.             |

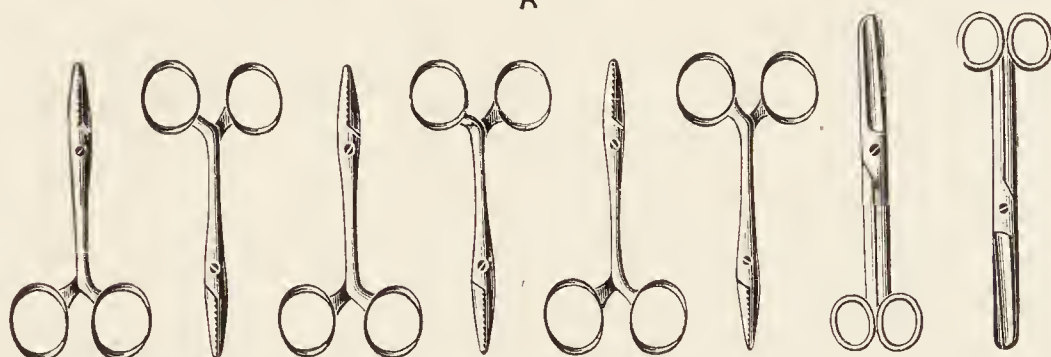
If the cyst is in the posterior wall of the vagina, a vaginal retractor will be required.

The ring forceps are used as swab holders.

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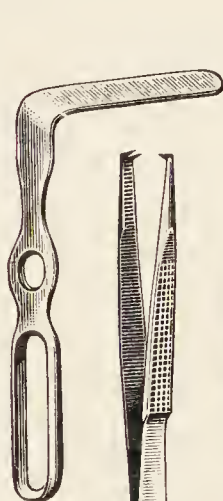


A



B

C



D



E



F



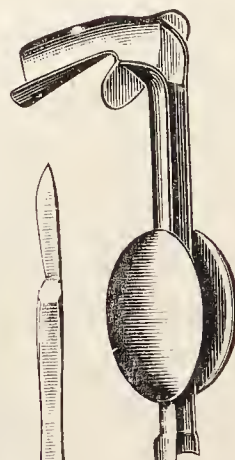
G



H



M



N



O



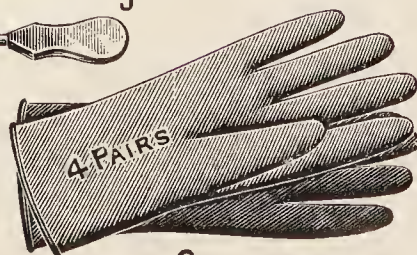
P



Q



R



S

FIG. 57.



## The Radical Operation for Malignant Disease of the Uterus. (Fig. 58.)

|       |                                       |       |                              |
|-------|---------------------------------------|-------|------------------------------|
| A.    | 12 Long pressure forceps.             | N.    | 4 Spring clips.              |
| A'.   | Scalpel.                              | O.    | 2 Tubes catgut, No. 2.       |
| B.    | 3 Ring forceps.                       | P.    | 4 No. 5 half-circle needles. |
| B'.   | Vaginal clamp.                        | Q.    | 2 No. 9       "       "      |
| C.    | 4 Long angular forceps.               | R.    | 2 No. 13       "       "     |
| D, E. | 2 Dissecting forceps, long and short. | S.    | Bladder retractor.           |
| F.    | Probe.                                | T.    | Aneurysm needle.             |
| G.    | Catheter.                             | U.    | Worrall's needle.            |
| H.    | 6 Short pressure forceps.             | V.    | Gloves, 4 pairs.             |
| J.    | Self-retaining retractor.             | W.    | India-rubber sheeting.       |
| K, L. | Michel's clip apparatus.              | X.    | Long scissors—angular.       |
| M.    | 3 Reels silk, Nos. 6, 4, and 2.       | Y, Z. | 2 Scissors—straight, blunt.  |

Those surgeons who use Reverdin's needle, or some modification thereof, will require No. 13 needles only. Such surgeons may also require wristlets.

The self-retaining retractor depicted in the illustration is that devised by the author. The clamp is the Berkeley-Bonney pattern. The angular forceps are Kocher's. Two pairs of dissecting forceps will be required, one long for the operator and one short for the instrument sister, and two pairs of straight scissors likewise. The spring clips are to keep the body-cover in position. The Michel's clip apparatus is the author's pattern. The india-rubber sheeting is to protect the wound edges.

The object of the radical operation is to remove the growth together with as much tissue of the pelvis as is possible, including the lymphatic glands, so as to ensure, so far as can be, that all tissues infiltrated with cancer cells, that have spread from the growth, shall be extirpated. This means that the ureters have to be dissected clear of the growth, a dangerous procedure, since they may be cut, or may have to be cut, but more often they are stripped of a good deal of their blood-supply and so sometimes slough during the first nine days of convalescence. Since the lymphatic glands may be adherent to the external or internal iliac veins the removal of these glands, in such circumstances, is also highly dangerous, the vein on occasions being wounded and having to be tied. The operation is associated with the name of Wertheim owing

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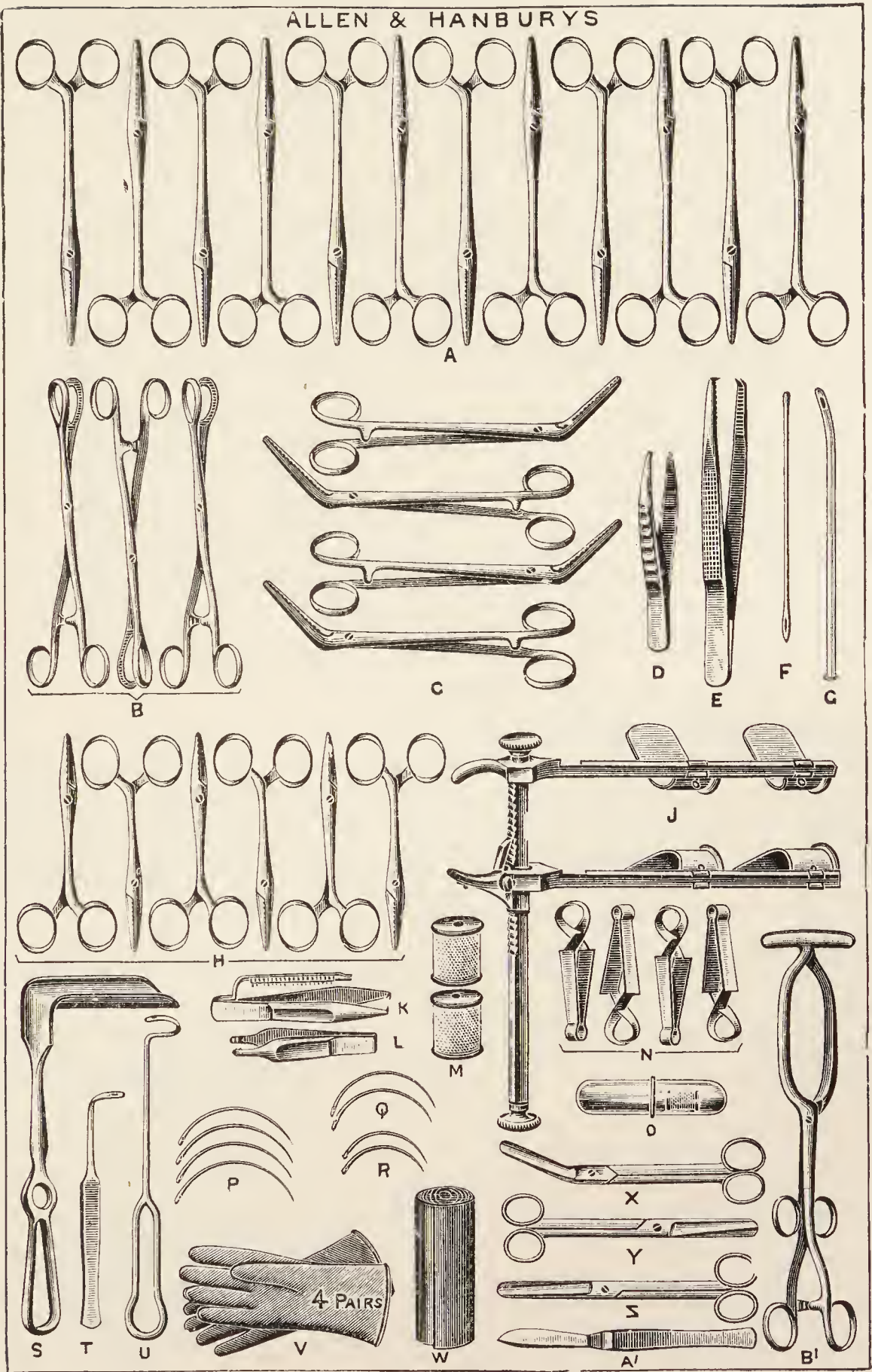


FIG. 58.



to his improvement of removing the growth in a bag of vagina, by clamping the vagina well below the level of the growth, and then dividing the vagina below the clamp. This was a remarkable improvement in that it reduced the danger of a local recurrence to a minimum.

**Abdominal Hysterectomy — Myomectomy — Ovariotomy — Oophorectomy — Salpingectomy — Salpingostomy — Salpingo-Oophorectomy — Ventral Suspension — Shortening of the Round Ligaments — Cæsarean Section — Appendicectomy. (Fig. 59.)**

- |       |                                       |       |   |
|-------|---------------------------------------|-------|---|
| A.    | 12 Short pressure forceps.            | M, N. | Michel's clip apparatus.                                      |
| B.    | 3 Long pressure forceps.              | O.    | 2 Rubber drainage tubes, $\frac{3}{4}$ in., $\frac{1}{4}$ in. |
| C.    | 3 Ring forceps.                       | P.    | Catheter.   |
| D.    | Volsellum forceps.                    | Q.    | 2 Tubes catgut, No. 2.  |
| E, F. | 2 Dissecting forceps, long and short. | R.    | 2 Reels silk, No. 4, No. 2.                                   |
| G.    | Self-retaining retractor              | S.    | 4 No. 5 half-circle needles.                                  |
| H.    | 4 Spring clips.                       | T.    | 2 No. 9 „ „   |
| J.    | Probe.                                | U.    | 2 No. 13 „ „  |
| K.    | 2 Scissors, blunt pointed.            | V.    | Gloves, 4 pairs.  |
| L.    | Scalpel.                              |       |   |

In addition to the list of instruments enumerated, some surgeons wish bowel-clamps to be included, in case a portion of the bowel has to be resected. Those surgeons who use Reverdin's needle, or some modification thereof, will require No. 13 needles only. Such surgeons may also require wristlets.

Some of the operations indicated can easily be performed with only a few of the instruments mentioned in this list. A surgeon, however, cannot be certain, until he has opened the abdomen, of the exact condition which will be disclosed. The author finds it more convenient, except in the case of the radical operation for cancer, to work always with the same number and variety of instruments, and with them the most serious, as well as the most simple, of the operations enumerated above can be performed.

The probe is put out in case the appendix has to be removed, when it is used to push the stump below the purse-string suture surrounding it. A pair of Spencer Wells forceps will do equally well.



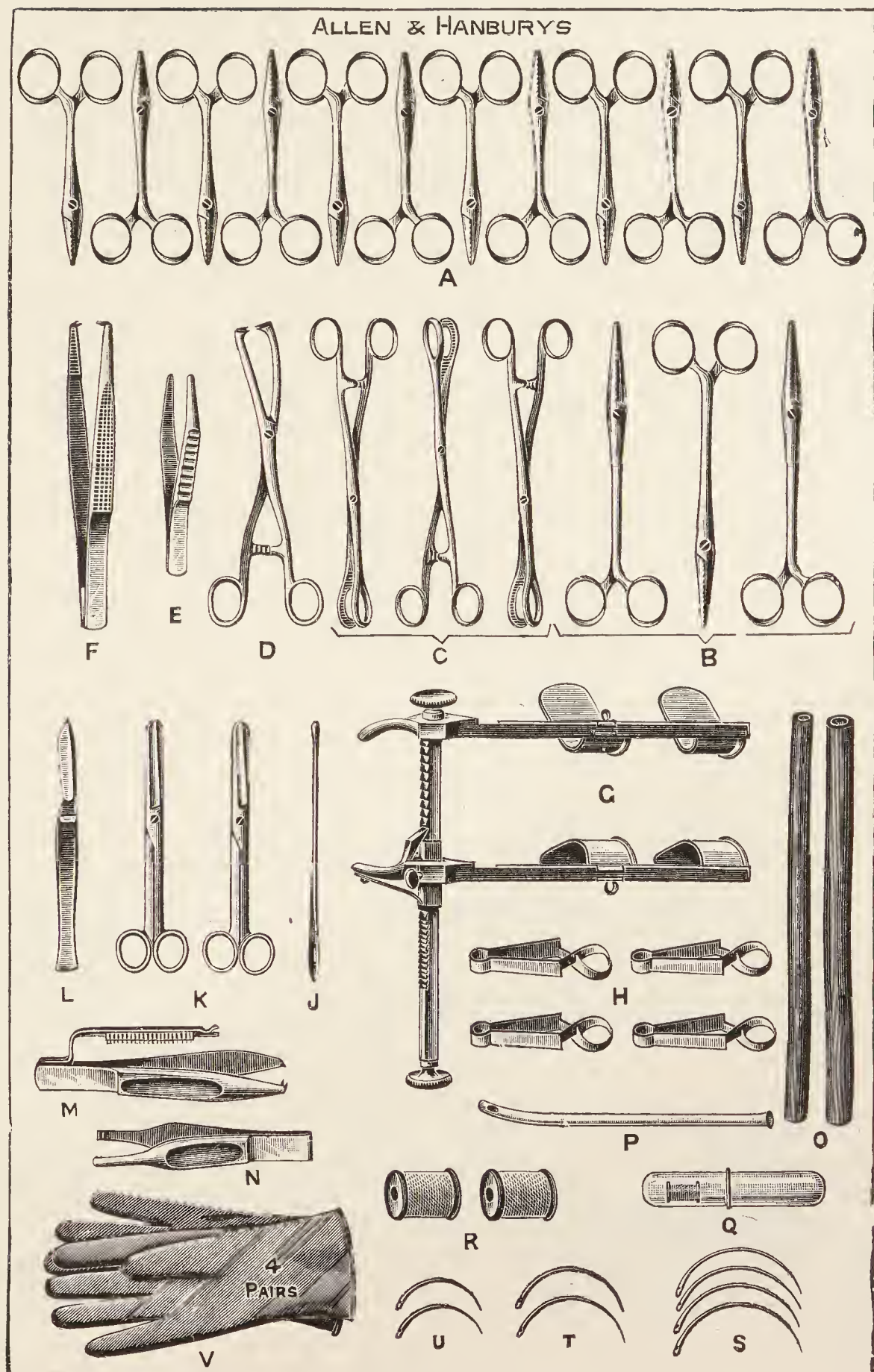


FIG. 59.

There is no need to discuss the operations mentioned above, since all that it is requisite for the nurse to know concerning most of them has been mentioned in the text. Abdominal hysterectomy is either total or subtotal (supra vaginal). Total when the whole of the uterus is removed, subtotal when the body of the uterus only, at the level of the internal os, is removed. Oophorectomy, i.e. the removal of normal ovaries, is now but very rarely practised. If it is absolutely necessary to stop menstruation, and radium or X-rays are not available, it is better to remove the uterus than the ovaries. Salpingostomy is an operation devised to restore the patency of the Fallopian tubes which are closed by inflammation and which are, therefore, a cause of sterility.

### Vaginal Hysterectomy—Colpotomy. (Fig. 60.)

- A. Clover's crutch.
- B. 6 Long pressure forceps.
- C. 3 Ring forceps.
- D. Volsellum forceps.
- E. Auvard's speculum.
- F. Worral's needle.
- G. Bladder sound.
- H. Scalpel.
- J. 2 Scissors, blunt pointed.
- K. 4 Spring clips.
- L. Catheter.
- M, N. 2 Dissecting forceps, long and short.
- O. 2 Vaginal retractors.
- P. 4 No. 5 half-circle needles.
- Q. 2 No. 9 " "
- R. Reel silk, No. 4.
- S. 2 Tubes catgut, No. 2.
- T. Gloves, 4 pairs.

Some surgeons use Reverdin's needles and wristlets.

For the operation of colpotomy, that is opening the pouch of Douglas by an incision through the posterior vaginal fornix, the instruments indicated above will be required with the exception of the bladder sound, the pedicle needle, the No. 5 half-circle needles, and the silk. Three pairs of pressure forceps will suffice. The ring forceps are used as swab holders,



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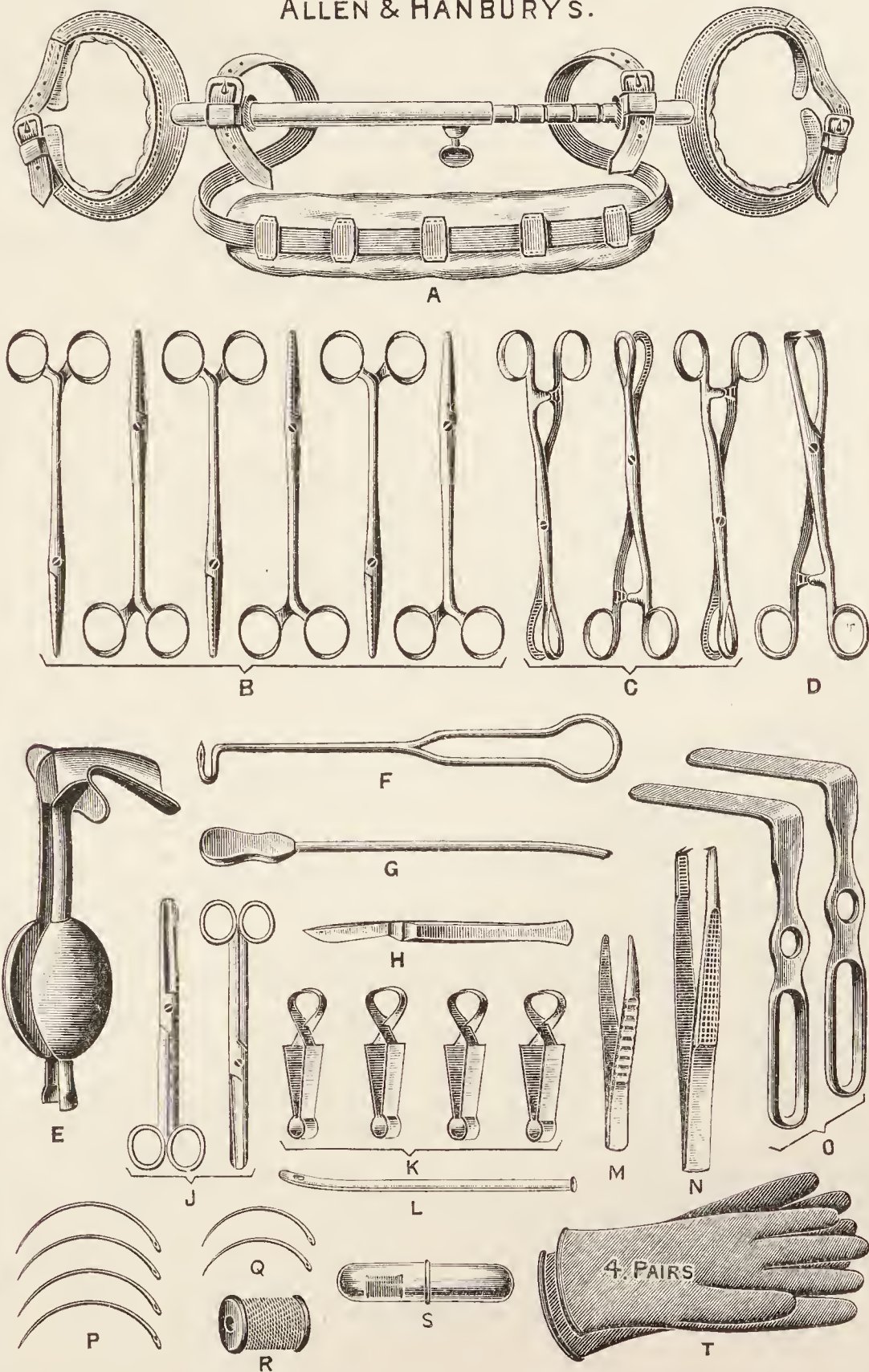


FIG. 69.



For this operation and the succeeding operations indicated, a Clover's crutch will not be necessary, if the operation table is provided with steel uprights to hold the ankles.

### Dilatation of the Cervix and Curettage of the Uterus. (Fig. 61.)

- |       |                            |    |                                     |
|-------|----------------------------|----|-------------------------------------|
| A.    | Clover's crutch.           | L. | Uterine sound.                      |
| B, C. | 2 Dissecting forceps.      | M. | Auvard's speculum.                  |
| D.    | 2 Volsellum forceps.       | N. | 2 No. 9 half-circle needles.        |
| E.    | 2 Long pressure forceps.   | O. | Gloves, 4 pairs.                    |
| F.    | 2 Ring forceps.            | P. | 2 Playfair's probes.                |
| G.    | Metal dilators.            | Q. | Flushing curette.                   |
| H.    | 4 Spring clips.            |    | Catheter (omitted in illustration). |
| J.    | 2 Scissors, blunt pointed. |    |                                     |
| K.    | Tube catgut, No. 2.        |    |                                     |

If, during the dilatation, the cervix has been lacerated and the bleeding is free, the dissecting and pressure forceps and the needles and catgut will be required for suturing.

The ring forceps are used as swab holders.

The pattern of the metal dilator depicted is Fenton's.

The cervix is dilated in some cases of dysmenorrhœa, to allow the inside of the uterus to be felt with the index finger to ascertain the presence, or not, of a piece of placenta, a polypus, or malignant disease of the uterus; to allow the curette to be used, and as a preliminary to the removal of uterine polpi or a submucous fibroid.

The operation of curetting consists in scraping the endometrium off the wall of the uterus. It is employed in cases in which the endometrium is very thick and in which there is excessive menstrual bleeding. Again, curetting may be successful in the treatment of sterility; as one medical student at his final examination put it, "a new tenant prefers a new wallpaper." The uterus is also curetted to obtain a specimen of the lining to ascertain whether the patient is suffering from cancer. Lastly, in the condition known as subinvolution, in which the uterus fails to return to its proper size after labour, curetting may be of assistance. Taking one case with another, however, curetting the body of the uterus is a disappointing operation, especially for the symptoms of leucorrhœa, and one very much abused, quite apart from the fact that it may be a very difficult and dangerous operation, though supposed

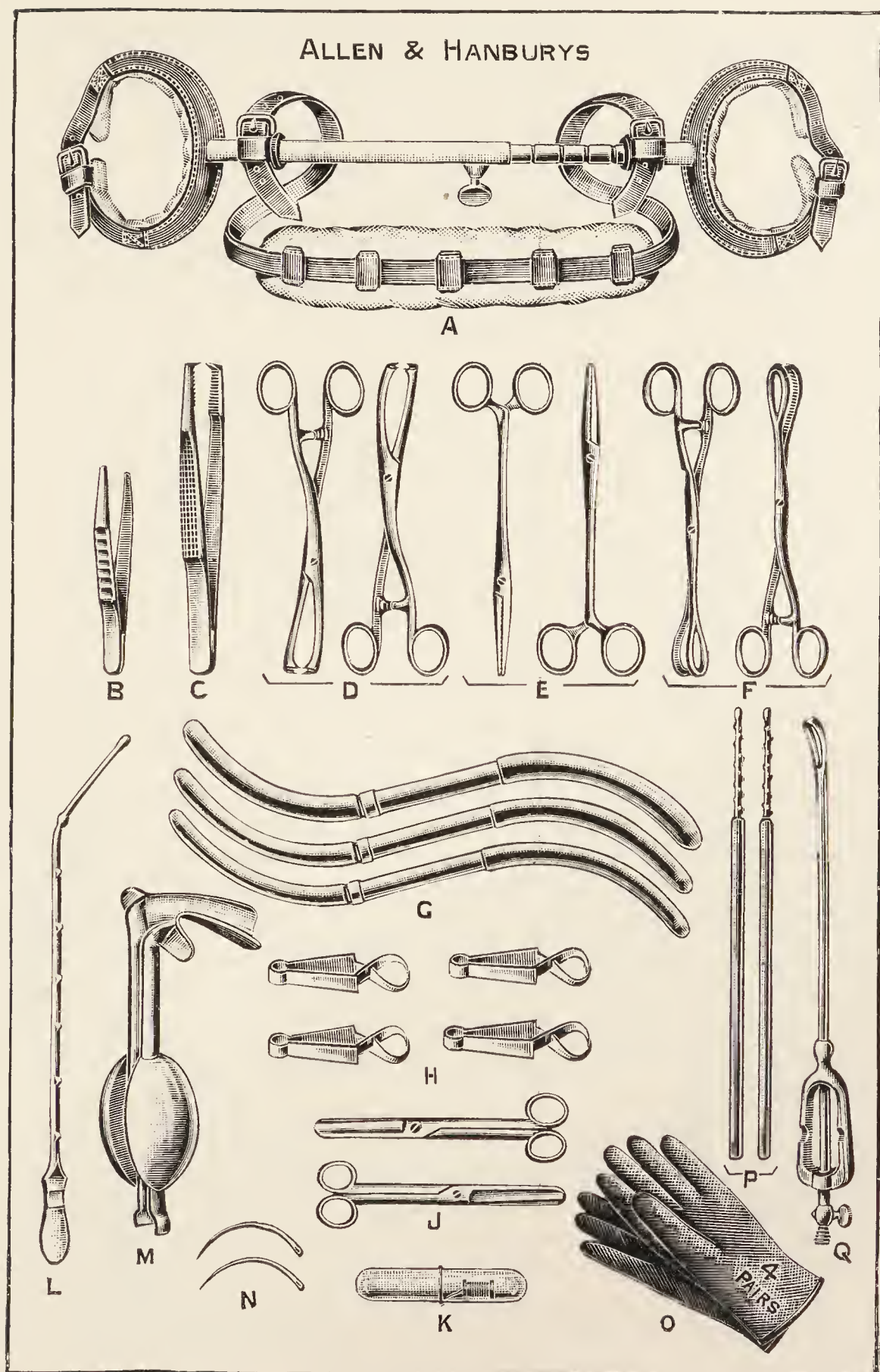


FIG. 61.

to be easy and safe. Except for a very few conditions, women are generally worse after a curetting than before, some of them very much worse, though curiously enough, this is no reason for curetting them again.

**Perineorrhaphy — Colporrhaphy — Trachelorrhaphy — Amputation of the Cervix—Removal of a Sub-mucous Fibroid, of a Fibroid or Mucous Polypus.**  
(Fig. 62.)

- |   |   |
|---|---|
| A. Clover's crutch.                         | L. Auvar'd's speculum.                  |
| B. 3 Short Kocher forceps.                  | M. Bladder sound.                       |
| C. 6 Short pressure forceps.                | N. 2 No. 5 half-circle needles.         |
| D, E. 2 Dissecting forceps, long and short. | O. 2 No. 9 "                            |
| F. Scalpel.                                 | P. 3 Tubes of catgut, 2 No. 2, 1 No. 3. |
| G, H. 2 Scissors, sharp and blunt pointed.  | Q. 4 Spring clips.                      |
| J. Volsellum forceps.                       | R. Catheter.                            |
| K. 2 Ring forceps.                          | S. Gloves, 4 pairs.                     |

For the operation of trachelorrhaphy, amputation of the cervix, removal of a sub-mucous fibroid or polypus metal dilators will be required.

The ring forceps are used as swab holders.

The operation of perineorrhaphy consists in fashioning a new perineum, the triangular structure between the lower inch of the vagina and rectum and, in many cases, also for curing the bulging of the lower part of the rectum (rectocele) with which a deficient perineum is often associated. The operation is principally concerned with removing the excess of vaginal wall, suturing the levatores ani and adjacent connective tissue together, and reducing the size of the vaginal orifice.

Anterior colporrhaphy is indicated when the woman is troubled by a swelling consisting of part of the bladder covered with anterior vaginal wall which bulges through the vaginal orifice and leads to frequency and, in severe cases, difficulty of micturition. The operation consists in removing the excess of the anterior vaginal wall, separating the bladder from the supra-vaginal cervix, pushing it up and inserting sutures below it so that it cannot again bulge.



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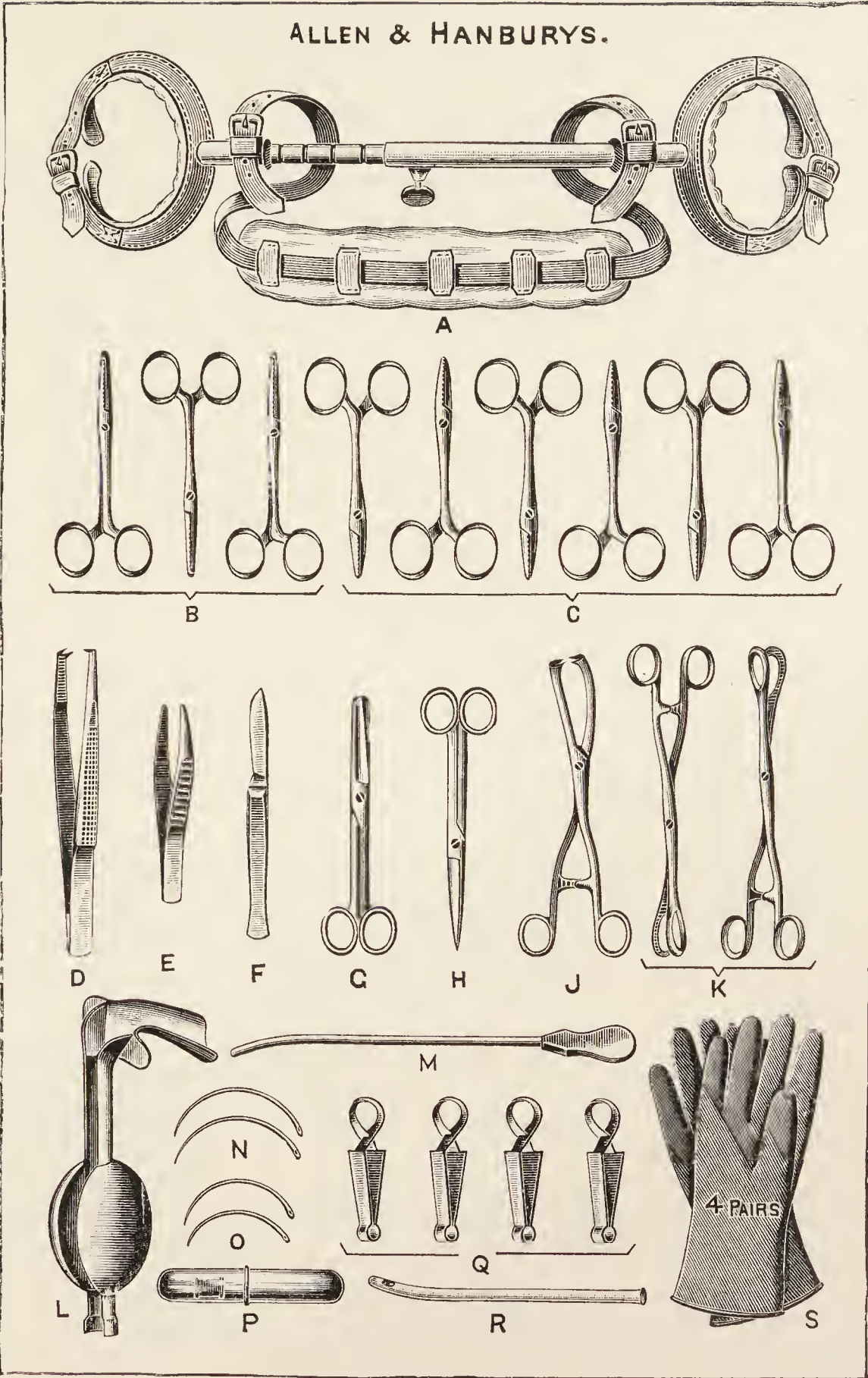


FIG. 62.

Posterior colporrhaphy is indicated when the lower part of the rectum covered by posterior vaginal wall bulges through the vaginal orifice. The operation for this condition is more often combined with a perineorrhaphy.

Trachelorrhaphy is performed in those cases in which leucorrhœa is profuse and due to a chronic cervicitis associated with a split cervix. The split cervix is repaired by making its edges raw and then suturing them together. If the cervix is badly split the best treatment is to amputate the cervix. Trachelorrhaphy is also performed in some cases of sterility.

### Vesico-Vaginal and Recto-Vaginal Fistulæ. (Fig. 63.)

- A. Clover's crutch.
- B, C. 3 Scissors—2 blunt pointed, 1 sharp pointed.
- D. 4 Long pressure forceps.
- E. Scalpel—narrow blade.
- F, G. 2 Dissecting forceps, long and short.
- H. Vaginal retractor.
- K. Cleft palate needle-holder.
- L. 2 Ring forceps.
- M. Bladder sound.
- N. Auvard's speculum.
- O. 2 No. 2 cleft palate needles.
- P. 2 No. 9 half-circle needles.
- Q. 4 Spring clips.
- R. 2 Tubes catgut, No. 1, No. 2.
- S. Gloves, 4 pairs.

In the absence of a cleft palate needle-holder, a long pressure forceps can be used. A vesico-vaginal fistula, high up in the anterior fornix is difficult to close. It is easier in such a case to use cleft palate knives, forceps, needle-holders, and needles.

The vaginal retractor will be required for a recto-vaginal fistula. If the surgeon elects to use a Reverdin's needle when performing any vaginal operation, the ordinary needles may not be required.

The constant passage of urine or fæces into the vagina leads to such inconvenience and misery that, if possible, the hole connecting the various organs must be closed by operation. It is, however, only when the cause of the fistula has been traumatic that an operation is indicated, since if the fistula is due to cancer the condition is hopeless, and if to syphilis or tubercle, the disease itself must be treated.



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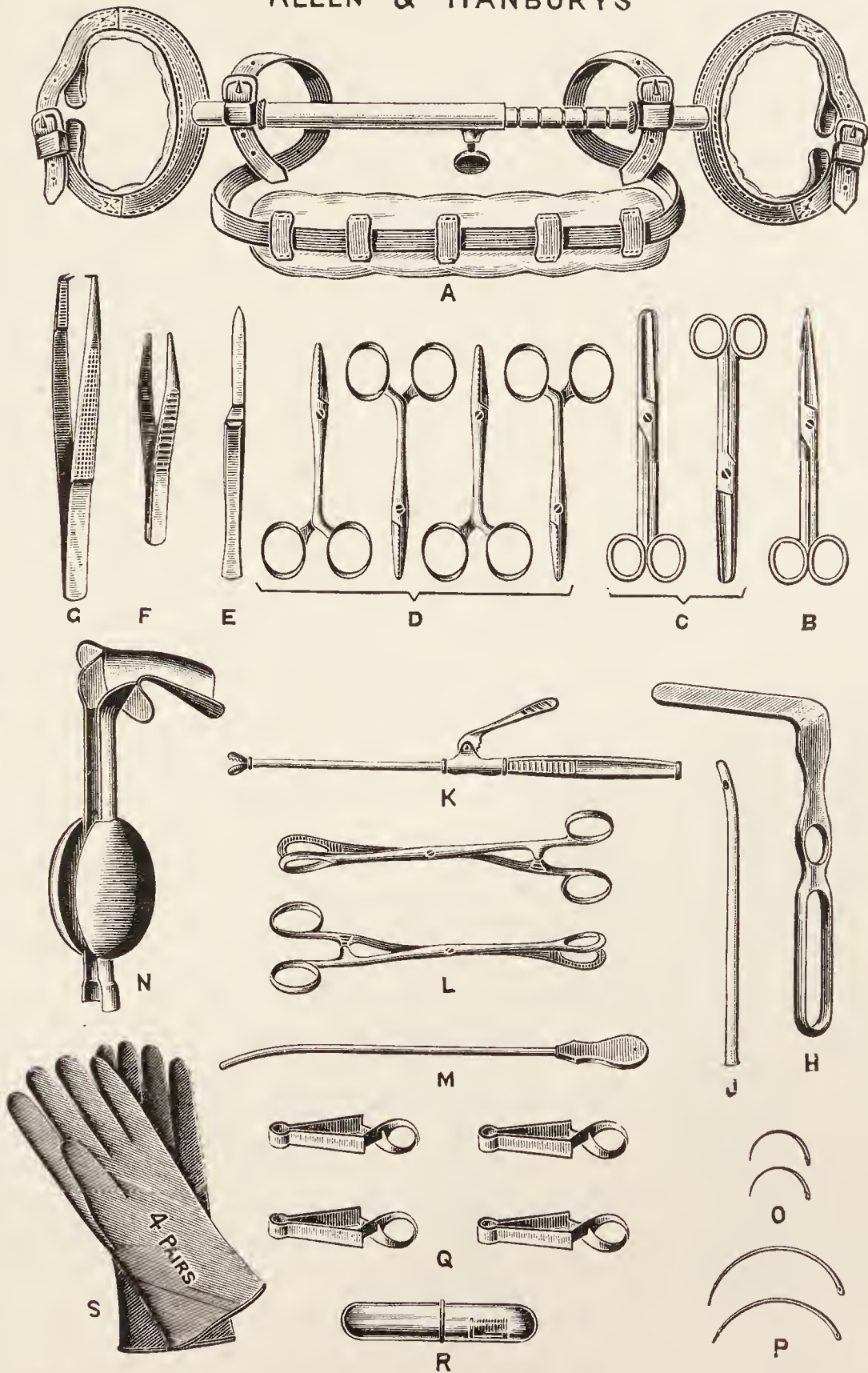


FIG. 63.



**Cystoscopy.** (Fig. 64.)

The following articles are required for cystoscopy :—

- A. Clover's crutch.
- B. Cystoscope and battery.
- C. Syringe for washing out the bladder.
- D. Tube and funnel.
- E. Syringe for applying novocaine to the urethra.
- F. Glass measure.
- G. 2 Kidney trays.
- H. Gloves.
- Solution of novocaine.
- Jar of glycerine.
- Can of lotion.

The surgeon will use either the tube and funnel or the bladder syringe for injecting water into the bladder. The urethral syringe and novocaine are for a local anæsthetic if the surgeon wishes.

*Method of Sterilizing the Cystoscope.*—Before using the instrument it is placed in 1 in 60 carbolic acid solution for 30 minutes. After being used the cystoscope is carefully flushed through with cold water to remove any blood clots that may be present, and then placed in 1 in 60 carbolic acid solution for 15 minutes, after which it is rinsed through with methylated spirit before being dried, all screws, caps and washers being removed.

*Duties of the Nurse.*—The light of the cystoscope should be tested before handing the instrument to the surgeon. The patient must be placed either in the lithotomy position, or on her back with a sand bag under her pelvis.

The temperature of the solution to be used for washing out the bladder is 100° F. The nurse will have to keep the tubes and funnels filled, or if syringes are used she may be directed to fill these. If the cystoscope is being inserted into the bladder with the patient on her back, the nurse, by arranging two macintoshes, one on the abdomen and the other across the knees, will ensure that the patient does not get wet from the "drippings."

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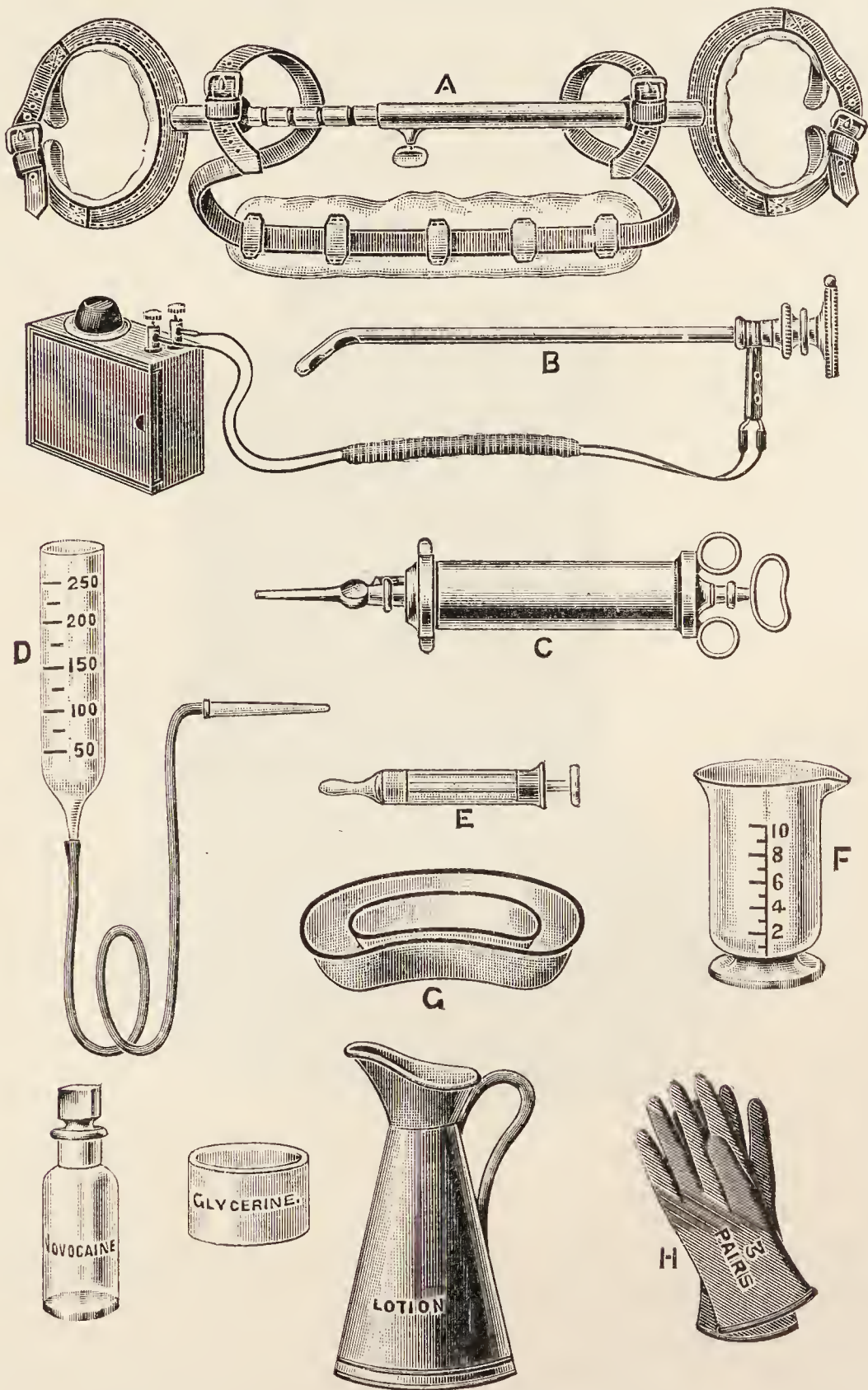


FIG. 64.



## DIATHERMY.

*Instruments.*—In addition to the Diathermy apparatus, the instruments required will depend upon the site of the operation. The instruments must be sterilized by the usual method, and if the nurse does not know which instruments will be required she must ask the surgeon.

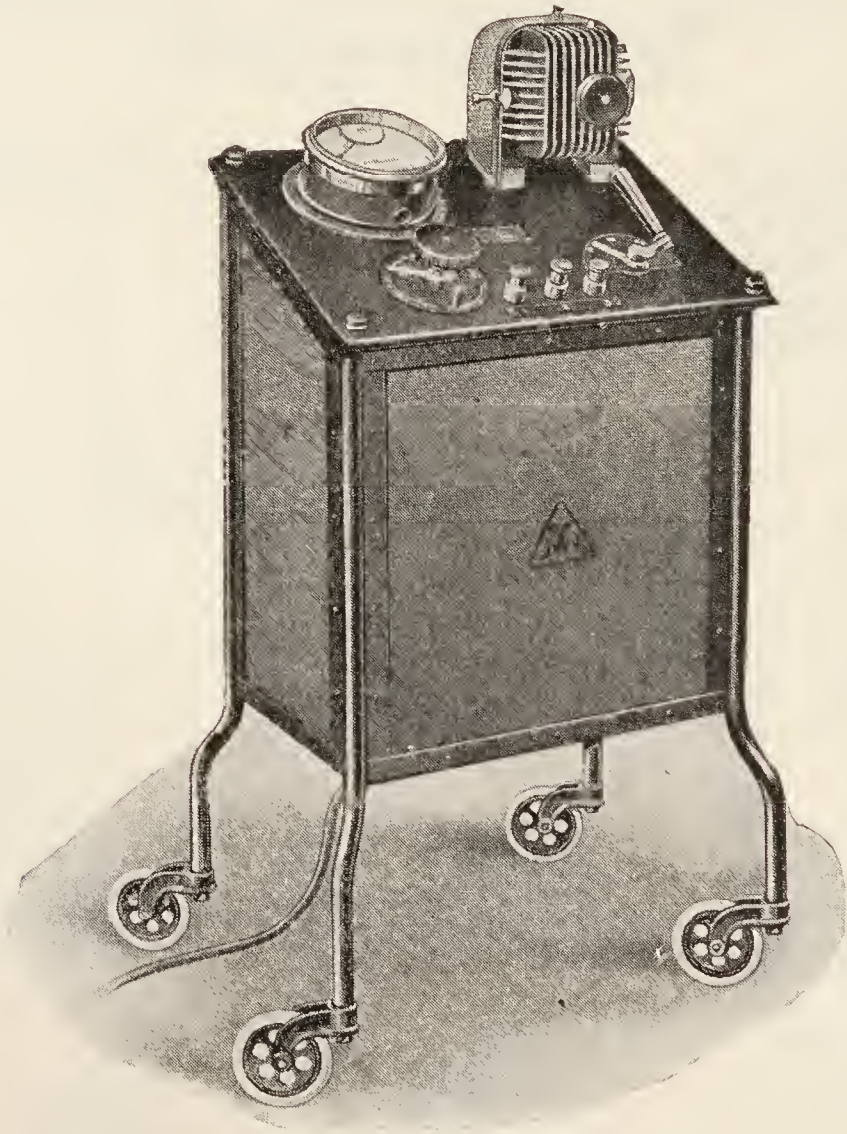


FIG. 65.—DIATHERMY APPARATUS.

*Preparation of the Patient.*—The patient is prepared as for any other operation, on that portion of the body in which the diathermic treatment is to be carried out.

*To Clean the Electrodes.*—Scrape any blood clot that has accumulated on the electrodes and then spark the gap.



*Duties of the Nurse.*—A nurse would not be accused of exceeding her duties if she reminded the anæsthetist to remove the ether bottle from the anæsthetic wagon. Indeed everyone in the theatre would be very grateful, since there is a distinct danger of the ether exploding and burning one or the other. Such an explosion happened in the experience of the author, at a nursing home, when the window curtains caught fire, and the operation had to be delayed while they were pulled down and trampled upon.

The nurse may be directed to apply the diathermy pad to the abdomen or thigh by the surgeon. The pad must be placed between pieces of lint soaked in normal saline solution.

The handle of the electrode should be covered with a sterile towel.

## Removal of a Urethral Caruncle. (Fig. 66.)

- A. Clover's crutch.
- B. Actual cautery.
- C. Bladder sound.
- D. Dissecting forceps.
- E. Scissors, sharp pointed.
- F. Gloves, 3 pairs.
- G. 4 Spring clips.

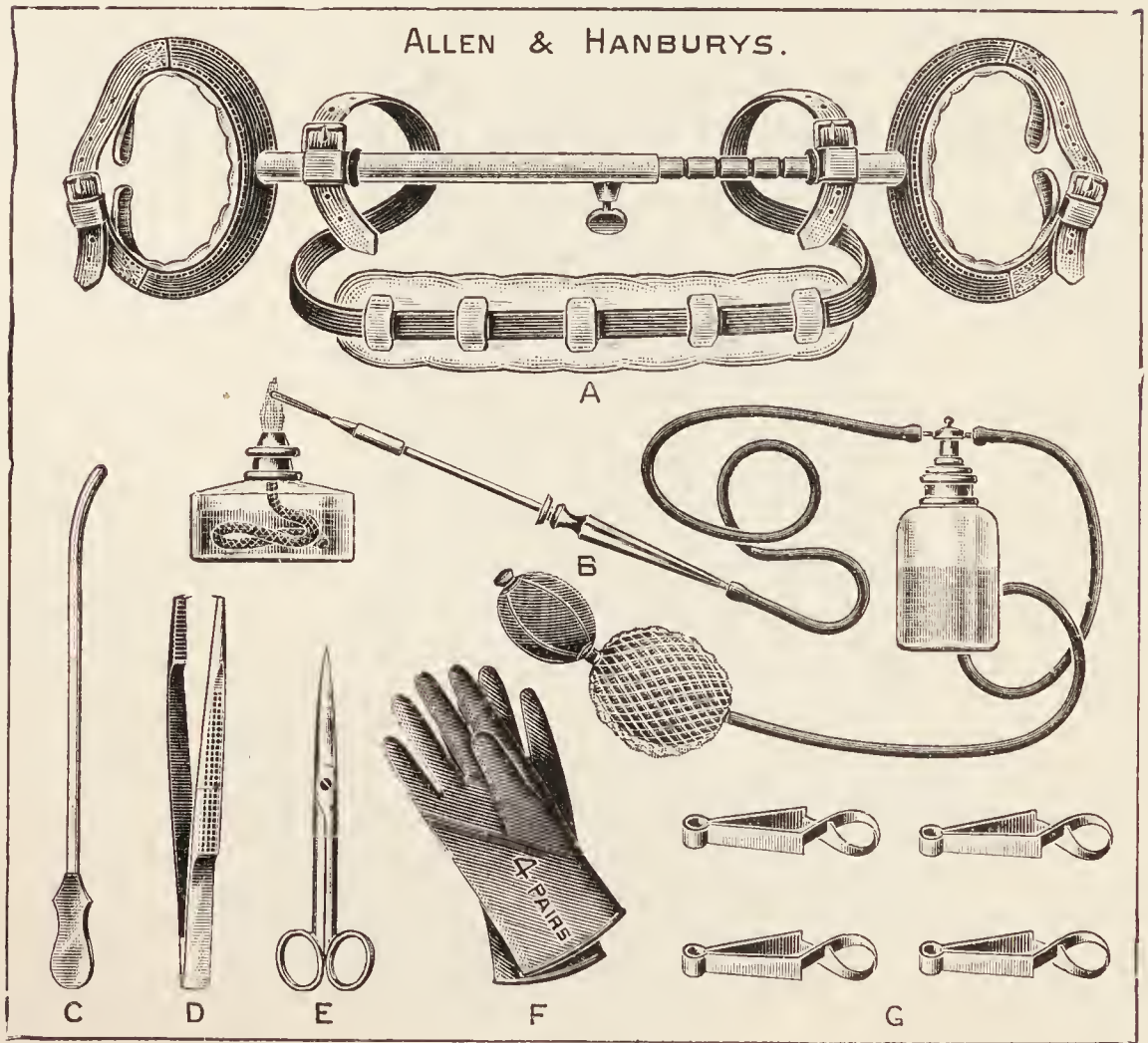


FIG. 66.

The caruncle having been removed with scissors the bleeding base is cauterized, not because of the bleeding but to ensure that every portion of the caruncle is destroyed, recurrence otherwise being common.

## Out-Patient Department. (Fig. 67.)

- |                         |                          |
|-------------------------|--------------------------|
| A. Sims's speculum.     | H. Napier's cup and stem |
| B. Rectal speculum.     | pessaries.               |
| C. 2 Ring forceps.      | J. Bladder sound.        |
| D. Ring pessaries.      | K. Catheter.             |
| E. Hodge pessaries      | L. Volsellum forceps.    |
| F. Uterine sound.       | M. Ferguson's speculum.  |
| G. 2 Playfair's probes. | N. Rubber gloves.        |

Solution of biniodide of mercury (1 in 2000).

Absorbent wool swabs in a bowl.

Absorbent wool.

Iodized phenol ; carbolic acid, a saturated solution of picric acid in rectified spirit.

ALLEN & HANBURY'S

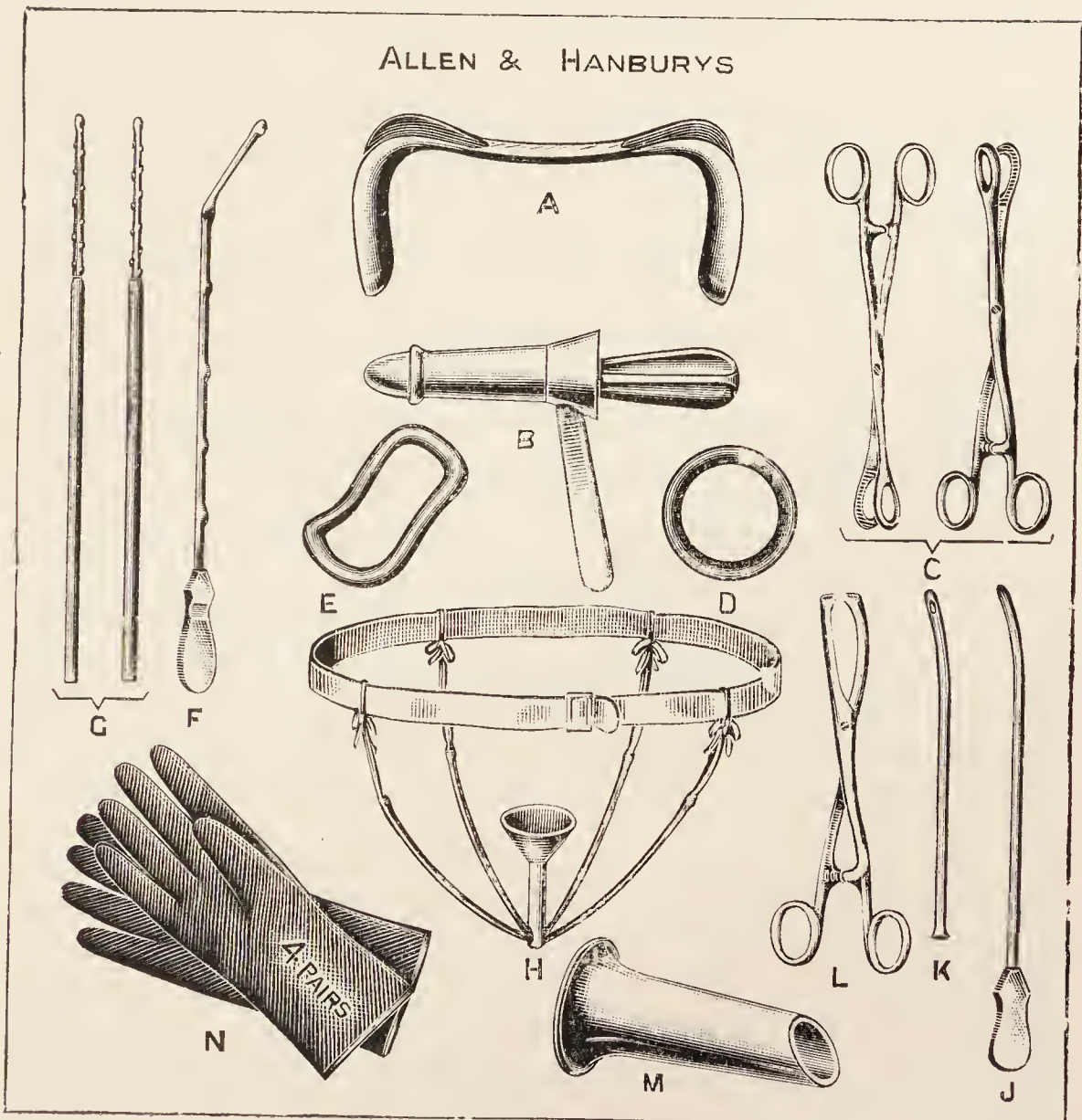


FIG. 67.



## PART XVI.

### CHAPTER XXXIII.

#### DUTIES OF A NURSE JUST BEFORE AND JUST AFTER AN OPERATION.

THESE duties consist of—

1. Care of the patient during her transit from the ward to the anæsthetizing room.
2. Care of the patient during her transit from the operating theatre to the ward.
3. Care of the patient in the ward.

#### Care of the Patient during her Transit from the Ward to the Anæsthetizing Room.

1. A canvas stretcher and a macintosh covered by two towels are placed on the ambulance.
2. Prior to the patient being placed on the ambulance any dental plate she may have in her mouth should be removed and any hairpins in her hair taken out. She should also leave her handkerchief behind.
3. The patient is lifted on to the ambulance and covered with two blankets.
4. The doors of the anæsthetizing room must be kept closed so that the patient, when she is wheeled into it, shall not be able to see the interior of the operating theatre, since it is important to avoid causing her any mental distress. The sight of the necessary preparations, of the presence of visitors, perhaps of an operation just being concluded, or of blood on the towels or floor, will be most alarming to some patients.

5. On the arrival of the patient in the anæsthetic room, if the anæsthetist prefers her hair to be covered, this should be done by means of a sterile towel folded round the back of her head and pinned in front, in such a way that all the hair is inside the towel.

6. Before the administration of the anæsthetic is commenced the neck of the nightgown and jacket worn by the patient should be untied and loosened. The ends of the nightgown should not be turned in, because if pulled from beneath the patient when under the anæsthetic, they may rub the skin on her back. A nurse should remain by the side of the patient until she is under the influence of the anæsthetic.

### Care of the Patient during her Transit from the Operating Theatre to the Ward.

1. At the termination of the operation the patient should be very gently lifted on to the ambulance, and covered with blankets. Her head should be turned to the left side, a towel should be placed under her chin, and a porringer containing a pair of tongue forceps should be placed by the side of her head, in case she vomits, or ceases breathing.

2. On the way back to the ward the nurse should push the angle of the lower jaw of the patient forwards, and watch carefully that she continues to breathe properly.

If the tongue falls back blocking the air passage the patient stops breathing and gets blue in the face because the chin is not being held properly, and in such a case if further manipulation of the chin is not sufficient, the nurse, unless a doctor is near, should take hold of the tongue of the patient with the pair of forceps and pull it forward between the teeth.

### Care of the Patient in the Ward.

1. On her return to the ward the patient should be very gently lifted with the canvas stretcher on to her bed which has been specially prepared meanwhile, and covered with blankets, *the hot-water bottles which have been placed in the bed during the operation being removed.* To remove the canvas

stretcher after the patient is in bed, she should be gently rolled from one side to the other.

2. A pillow should then be placed under the knees of the patient, and in the case of a gynæcological operation a pad is applied to her vulva, so that any loss from her vagina can be easily detected.

3. Hot-water bottles, if they and their stoppers are thoroughly protected with thick flannel covers, may be placed outside the blanket along the lower extremities of the patient. Some surgeons prefer that the hot bottles should be removed altogether when the patient is returned to her bed and until she has recovered from the anæsthetic.

4. The bed-clothes are then arranged over the patient, her head is turned to one side and the pillow put well under her shoulder; a towel is placed under her chin and a porringer on the locker by her side, to be immediately available if she vomits.

The pulse should then be felt and a note made as to its rate and character.

5. She must remain by the bed of the patient until the latter has sufficiently recovered to speak to her.

6. She should keep a watch on the patient afterwards, noting whether her pulse is good, if she is breathing properly, and is of a good colour. Thus the tongue may fall back and partly suffocate the patient when it must be pulled forward.

7. She must inform the sister of the ward if anything untoward occurs, or if the operation is in a private house, she must send for the doctor.

8. If, after an operation, blood comes through the dressings the nurse should act according to the amount of loss she judges to have taken, or to be taking, place. Thus if the amount is reasonably slight and there is only a "staining" more sterilized wool should be applied under another bandage. It is quite wrong, although not unusual in such cases, for the nurse to take off all the dressings and re-apply fresh ones, much to the annoyance of the surgeon.

On the contrary, it is not unusual for a nurse to treat a severe hæmorrhage by applying more wool and a bandage only, when the thing she should do is to send for medical assistance at once, meanwhile removing the sodden dressing and firmly applying fresh dressing.



The additional precautions after a "spinal" anæsthetic are detailed on page 394.

### CAUTION.

During the early stages of being anæsthetized the patient may sometimes struggle, and if an "alcoholic" somewhat violently. Nurses usually apply far too much force in their endeavours to restrain such struggles. The force to be applied should be sufficient only to counteract the struggles, that is, the patient should not be pinned down.

If hot-water bottles are left in the bed, even outside the blankets, a restless patient may easily disturb them and burn herself. A certain amount of intelligence is required when using hot-water bottles. Thus if the character and rate of the pulse are good, and the patient is perspiring, or if the day is very hot, their use is superfluous, if not injurious.

If the operation is an abdominal one and there is retching or vomiting, the nurse must support the abdomen with a hand on each side of the incision to prevent undue straining of the sutures, and this will also lessen the pain. When the vomiting has ceased, the nurse should cleanse the mouth with small wool dabs wrung out of a solution of glycothymoline and held in forceps.

The nurse should not pay any attention to what the patient may have said while under the influence of the anæsthetic, and should never repeat it either to the patient or to anyone else.

## CHAPTER XXXIV.

### ASEPTIC TECHNIQUE FOR OPERATIONS IN A PRIVATE HOUSE.

THE facility and safety with which operations can be carried out in private houses depends upon the means and surroundings of the patient and the training and intelligence of the nurse. In some cases, when efficient nursing assistance can be obtained, and the various articles of furniture necessary for an operation can be hired, and a complete sterilized outfit can be purchased, an operation can be conducted with comfort to the gynæcologist and, so far as the aseptic technique is concerned, with safety to the patient. On the other hand, an operation may have to be performed amidst surroundings which are very primitive, and the nurse will have to do the best she can. An intelligent and well-trained nurse will usually be able to make satisfactory arrangements with the means at her disposal. It is only the unintelligent, badly trained and stupid nurse who will create difficulties and fuss everyone about the place.

When an operation is to be performed in a private house the following subjects must be considered by the nurse:—

1. Preparation of the room.
2. Preparation of the instruments, sutures, ligatures, and swabs.
3. Preparation of the nurses and their duties at the operation.
4. Preparation of the dressings.
5. Immediate care of the patient after the operation.

#### Preparation of the Room.

**Room.**—If possible a room should be chosen which has a north light, is well ventilated, and is not near the water-

closet. If the window of the room is overlooked it should be covered with thin muslin or smeared with sopacious or a thin solution of whitewash. The day preceding the operation the walls and all the woodwork in the room should be thoroughly dusted ; particular care being taken with the tops of the doors and windows. The carpet, curtains, and upholstery on the bed should be removed, together with the pictures and all the furniture which will not be required. The woodwork and furniture should be dusted with damp dusters, and the walls also, should they happen to be painted. The floor should then be thoroughly scrubbed. The furniture and woodwork should again be dusted with a damp duster on the morning of the operation.

If, however, the operation is one of emergency, and there is not sufficient time to allow of all these preparations being made, then dust should not be disturbed by dusting. The furniture which will not be used should be removed as gently as possible, and a drugget or sheet wrung out in lysol (1 in 160) should be tacked down over the carpet, beneath the operating table, and the furniture not in use should be covered with clean sheets.

**Furniture.**—The following articles must be procured and arranged in convenient situations (see Figs. 68 and 69):—

|                           |                                |
|---------------------------|--------------------------------|
| Operating table.          | Instrument table.              |
| Table for dressings.      | Swab table.                    |
| Washstand.                | Sterilizer.                    |
| 2 Basins for hand lotion. | Anæsthetist's table and stool. |

1. As a rule the doctor will bring his own operating table. If not, a table must be procured, if possible, about 4 feet long, 2 feet broad, and 28 inches high for the patient to lie on during the operation. An ordinary kitchen table will be found to meet these requirements.

2. Six small square tables, one for the dry sterilized swabs or dabs, or if these are being rinsed then this table will be used to hold the two basins containing the water ; one for the instruments ; two for basins containing the lotion for the hands ; one for the anæsthetist's apparatus, and one for the dressings. Tea tables, work tables, washstands, or dressing tables will do, and if these are not available, very good



substitutes can be made with ironing boards, or leaves from an extension table resting on chairs. Chairs or packing cases will do for the hand lotion. These tables should be thoroughly dusted with a damp cloth, and then covered with

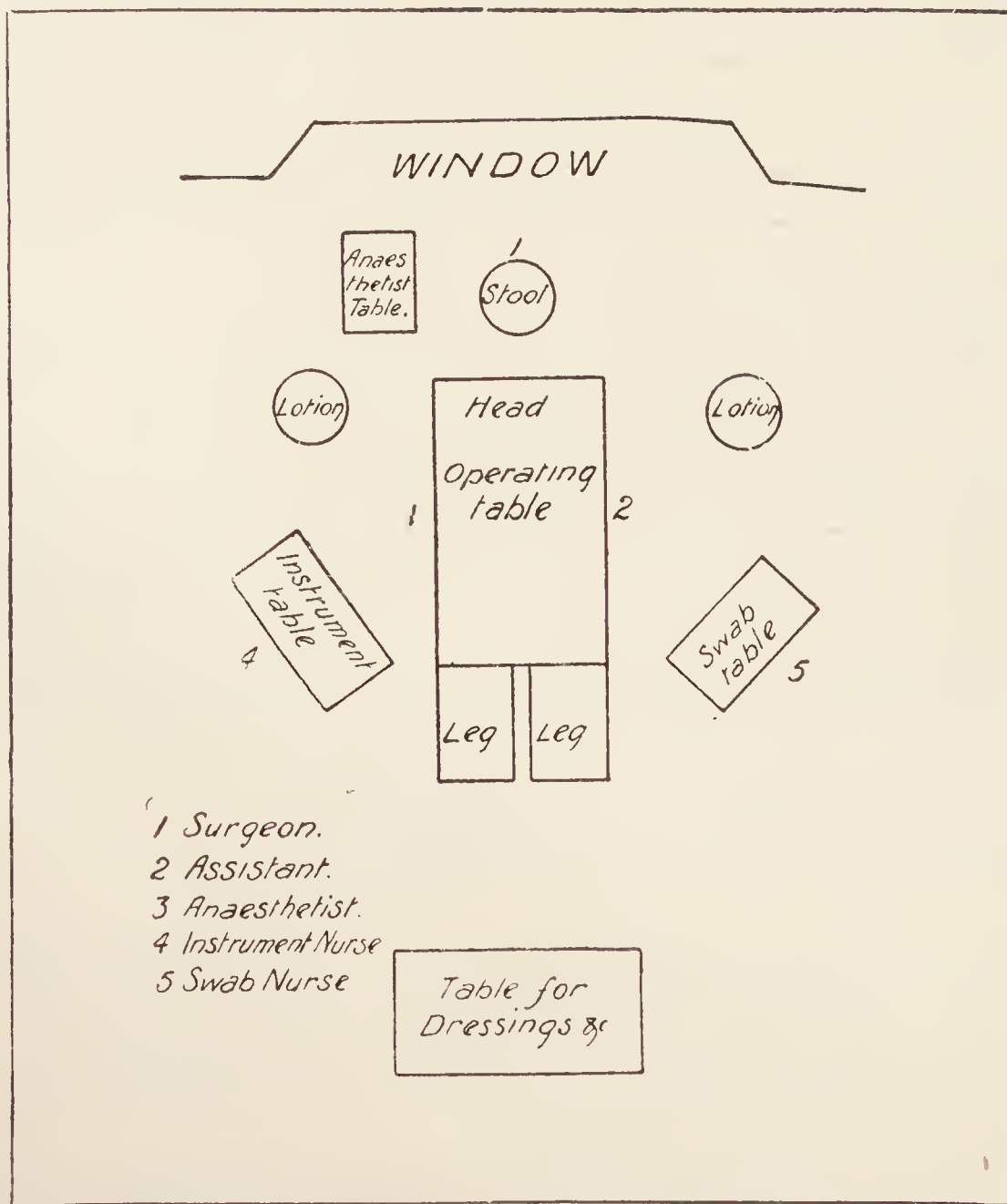


FIG. 68.—ARRANGEMENT OF TABLES FOR MAJOR OPERATIONS.

clean sheets or towels, and, if polished, with thick layers of paper first.

3. Two chairs with wooden or cane seats, one for the anaesthetist and one for the operator if he needs it.

4. A washstand to hold the basins for washing the hands.
5. A nail-brush sterilized by boiling, or by immersion in a solution of biniodide of mercury (1 in 2000).
6. A cake of soap.

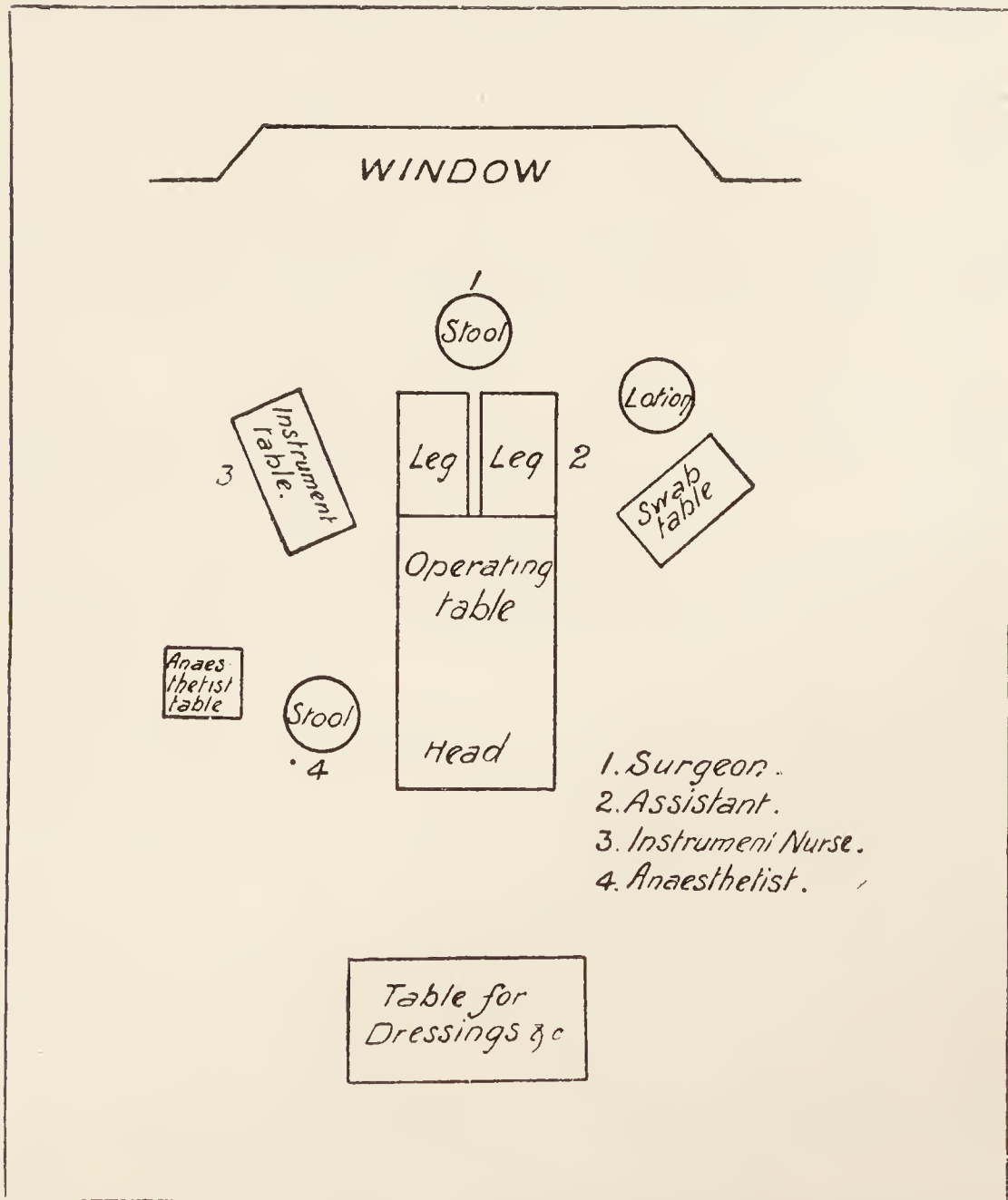


FIG. 69.—ARRANGEMENT OF TABLES FOR MINOR OPERATIONS.

7. Two clean blankets, one sheet, and one piece of macintosh sheeting for the operating table.

8. If the doctor does not bring sterilized towels with him, clean towels, not new, must be procured. The towels should be sterilized by boiling. At least eight may be required.

9. Two dishes, one for the instruments, measuring, if possible, 12 inches square, and a smaller dish, 6 inches square, for the ligatures and sutures. Meat dishes will do very well. Many surgeons prefer their instruments to be arranged on sterilized towels, in which case these dishes will not be required.

10. Six basins, two in which to wash the hands, two to contain the lotion (biniodide of mercury 1 in 2000) for the hands, and two for the swabs if dry sterilized swabs are not used.

These dishes and basins should be thoroughly cleaned and scalded before use, and then turned upside down and covered with towels until they are required, in order that dust may be excluded. They can be efficiently sterilized before use by burning in them a little methylated spirit.

11. A sterilizer. It will be necessary to have a sterilizer of some description, even if the instruments have been already sterilized, because an instrument may be dropped during the operation and have to be re-sterilized. In the absence of a proper instrument-sterilizer, the nurse should procure a fish-kettle, or saucepan large enough to take the instruments, which has been properly scoured, cleaned, and lined with a towel.

12. One gallon of cold water, which has been boiled.

13. One gallon of boiling water. The mouths of the jugs containing the water should have gauze tied over them.

14. A foot-bath or pail, properly cleansed, for receiving any soiled water or discharges.

15. A piece of oilcloth or linoleum to place under the table when vaginal or vulval operations are to be performed, so that the floor of the operating room and the ceiling of the room below can be protected. If oilcloth cannot be procured, newspapers should be used.

16. The bedstead should be thoroughly cleaned, the mattress aired, and the bed made up with clean sheets, a piece of macintosh sheeting over the lower sheet, and a clean draw-sheet over this.

17. Two hot-water bottles carefully covered with flannel so that they will not burn the patient should be provided in case they are wanted. Especial care should be taken that the metal stopper is not in any way exposed. *Unless properly*



*looked after, hot-water bottles are a source of the greatest danger to the patient who, when unconscious after the operation, is unable to feel them burning, with a result that very serious ulcers are caused, which may take two months or longer to heal. Patients who are thus burnt may sue the doctor, nurse or nursing home, and heavy damages have been obtained in such cases.*

18. After an abdominal section, or vaginal hysterectomy, a cradle will be wanted. If a proper cradle cannot be procured a very good substitute may be made by buying some wooden hoops, of a suitable size, as used by children, cutting them in half, and then joining the pieces together by three lengths of wood and screws. Such a cradle can be made in quite a short time by some male member of the household.

19. A douche-can, brandy, nutrient enema-syringe for giving brandy enemata, and the solution for giving saline injections, if the operation is of a serious nature, should be available.

It is better that the patient should occupy another room until the time arrives for her operation, but if this cannot be managed, screens should be provided to prevent the patient being alarmed by the preparations for the operation, and for the same reason, when the time comes for the screen to be taken away, all the instruments should be covered over with towels. If the operation is at night some sort of adjustable artificial light must be procured. An electric standard with a high candle-power lamp is the best. Gas decomposes chloroform, the result being very irritating to the throats of those present. In an emergency an acetylene bicycle lamp properly arranged will give a splendid light, and an electric torch may be found useful.

### **Preparation of Instruments, Ligatures, Sutures, and Swabs.**

**Instruments.**—Any nurse who professes to take surgical cases should know the names of the principal instruments, because she may be asked to attend to the instruments during the operation. The surgeon will bring his own instruments when operating in a nursing home or the house of a patient. The instruments used in gynæcological operations will be

found figured on pages 354 to 371. The method of sterilizing instruments will be found described on page 327.

**Sutures, Ligatures.**—Sutures most commonly used are of two varieties, mattress and continuous. A mattress suture is not tied in the needle, its length should be about 12 inches and it should be threaded with one end longer than the other. A continuous suture should have the end that is threaded tied close up to the needle, and its length should be about 24 inches. The average length of a ligature should be 18 inches.

A nurse who intends to take up surgical work in private should master the rules set out for a theatre sister on page 336, especially those which will be appropriate to operations in a private house. The method of sterilizing sutures and ligatures will be found on page 328.

**Swabs, Dabs.**—A method of making swabs for abdominal operations and dabs for minor operations, and their sizes, will be found on page 330. Swabs must be sterilized by steam pressure or by boiling, and dabs may be sterilized by chemical disinfectants.

## IMMEDIATE CARE OF THE PATIENT AFTER THE OPERATION.

This is dealt with on page 389.

The nurse should not allow any one in the room of the patient unless the doctor has given leave.

## CHAPTER XXXV.

### PREPARATION OF THE NURSE—PLACING THE PATIENT IN POSITION—ASSISTANCE DURING AND DUTIES AFTER THE OPERATION IN PRIVATE OPERATIONS.

THE preparation of the nurse, and the assistance she will and may be required to give during the operation, will be a combination of those to be found fully described under the rules set out on pages 332 to 341 for the theatre and ward sisters and theatre nurse.

It is obvious that if she be the only nurse available she must do the best she can in the circumstances.

If possible, and especially if the operation is of a serious nature, two nurses should be available at the time of, and for a week following, the operation. In this case during the operation one nurse should act as theatre sister and the other as ward sister and theatre nurse combined.

In the rules referred to, it will be seen that the nurses have to wear sterilized overalls and veils. Nowadays the surgeon generally sends or brings a tin containing the sterilized clothing for the nurses and doctors, and coverings and towels for the patient. Such tins, containing, already sterilized, the necessary articles of clothing for the surgeon, nurses, and the coverings, swabs, dabs, and dressings for the patient, can generally be obtained in most towns of any importance.

These articles are packed in separate tins according to whether they are required for a major or minor operation. If such a tin is not available the nurse, as already stated, must sterilize a number of towels by boiling them, and in place of an overall she must pin a large towel round her neck, so arranging the towel that it covers the front of her body.



### Sterilized Articles that the Tin should contain for a Major Operation.

|                |                               |
|----------------|-------------------------------|
| A body cover.  | 10 Small swabs.               |
| 6 Towels.      | 2 Yards of gauze.             |
| 3 Gowns.       | Half-pound of absorbent wool. |
| 3 Masks.       | A many-tailed binder.         |
| 2 Large swabs. | A packet of safety pins.      |

### Sterilized Articles that the Tin should contain for a Vaginal Hysterectomy or Minor Gynæcological Operation.

|                     |                               |
|---------------------|-------------------------------|
| A pair of leggings. | 3 Dozen dabs.                 |
| A perineal cover.   | 2 Yards of gauze.             |
| 4 Towels.           | Half-pound of absorbent wool. |
| 3 Gowns.            | A T-bandage.                  |
| 3 Masks.            |                               |

Figs. 49 and 50 show a sterilized tin containing these articles, as put up for the author by Messrs. Bell & Croyden. Different surgeons will vary the contents of these tins, according to their predilections, so that if the nurse is directed to procure such a tin, she must ask the surgeon whether he has a special tin of his own, and if not, what articles he wishes it to contain. The towels are used for covering the instrument and swab tables, and any part of the surroundings of the patient thought necessary and not protected by the body or perineal covers, and for the hands of the surgeon and nurses.

The method of preparing the india-rubber gloves and the hands will be found described on pages 332 and 334.

India-rubber gloves should be worn at all operations, and by all concerned in the immediate performance of the operation except the anæsthetist. By their use the risk of infecting the patient is very much diminished since they can be sterilized, whereas the hands cannot. In addition, gloves protect the hands of the nurse from contamination with any pus that may be present, and so lessen the chance of her conveying infection to some other patient.

### Placing the Patient in Position.

It is most important that a nurse who is helping at surgical operations in private should be thoroughly conversant with the proper method of placing the patient in position for an abdominal or vaginal operation. The nurse is referred to pages 256, 342, for a description thereof. In addition she should particularly remember :—

That every operating table has not got a foot-piece which will let down and to which the legs can be fastened before the patient is tilted in the Trendelenburg position. If this is so the legs of the patient cannot be fixed at right angles to her body, until she is tilted. While, therefore, the patient is being tilted the nurse must take hold of the ankles of the patient and, pushing them back, thus keep the legs at right angles to the body, otherwise the patient will slide down the table and her position will have to be readjusted. It is after the patient is in the required position that the ankles are tied to some part of the table.

Again, if a Clover's crutch is being used the nurse should remember that the rings of the cross-bar should be adjusted below the knees of the patient and not above. Also that the strap is passed over one shoulder, round the neck and under the opposite axilla.

Theatre training should always include the method of placing a patient in any of the recognized positions for operations. That it does not in all cases is evident from the pathetic scenes witnessed from time to time, when owing to the stupidity of the nurse the patient proceeds to slip into the lap of the anæsthetist, or the Clover's crutch is applied with the rings above the knees, the buckles in such a position that the straps cannot be attached and the strap entirely round the neck and nearly dislocating it. There is no use in telling the nurse in training *how* to fix the patient. The sister responsible for the training of probationers should have a live model on which the nurses can practise, one of themselves will do quite well. It is quite time that those who are responsible for the training of nurses should attend to such practical details as are now being discussed. Nurses could very well do with more

practical training and less theoretical, especially when the latter has no immediate connexion with their duties.

In some of the more enlightened hospitals as regards the training of nurses, there are now rooms set apart furnished with the articles used in an operating theatre. In this room the probationers are taught their duties so that when their term of duty in the operating theatre arrives such scenes as might shock the least sensitive of surgeons and visitors are eliminated.

If the operation is vaginal or vulval in nature the nurse can improvise a contrivance to conduct blood from the site of the operation, and any lotion that is used, into the pail, as follows. A macintosh, covered with a sterilized towel, is placed under the buttocks of the patient. The macintosh and towel should be rolled several times at the end upon which the patient will rest, and be so arranged that it will form a ridge and prevent fluids escaping under the back of the patient. The sides should then be folded in, to form a gutter, and the free ends should be inserted into the pail.

The patient should also have on a thick pair of stockings so that the rings of the Clover's crutch shall not injure her by their pressure. In addition a piece of wool should be inserted between the strap and the thigh in the neighbourhood of the buckle of the ring, to prevent the strap hurting the skin of the patient.

When a patient is fixed in the lithotomy position with a Clover's crutch, her body will be very unstable. It is therefore most important that the nurse should hold the patient in position by means of the crutch. If the nurse has to leave the patient she must ask the anæsthetist to hold the crutch meanwhile. The author has knowledge of a case in which the patient fell off the table, with very serious results, when this precaution was not taken.

### Preparation of the Dressings.

A list of the dressings which may be required for the different gynæcological operations will be found on pages 330, 332. The nurse must ascertain from the doctor what dressings he will require.



### Duties after the Operation.

**Tidying the Room after Operation.**—After the operation, and before the patient recovers consciousness, the soiled linen, operating table and instruments should be removed and the room rearranged, two tables being left, one for the dressings and one for the use of the nurse. If there is only one nurse she must ask some member of the household to do this since, as mentioned before, she must not leave her patient.

An armchair and a camp-bed or sofa, if there is only one nurse and it is necessary for her to remain in the room during the night, should also be supplied. A lamp, candle, or electric light, properly shaded, so that the nurse can read, and write her report, without disturbing the patient, will be required. The blinds must be drawn and the room kept as quiet as possible, so that the patient may sleep, if possible, when she comes out of the anæsthetic.

## CHAPTER XXXVI.

### ANÆSTHETICS.

WHEN operating in private the anæsthetist will bring with him most of the articles he will require. The nurse, therefore, will have to supply only a table covered with a clean towel and a chair, or stool, for the anæsthetist to sit on.

In hospital practice the nurse, whose duty it is, will have to provide a table on which she must place all the articles which the anæsthetist will require, or may require. They are as follows :—

A, B, C, D. Bottles of ether and chloroform. In some hospitals, in which the anæsthetist uses A.C.E., alcohol as well. Also an ethyl chloride spray.

E, F. A medicine bottle, fitted with a Hewitt's dropper, and a chloroform bottle.

G, H. Bellamy Gardner's wire mask for open ether. A chloroform mask.

J. A roll of gauze and a square of gamgee, 8 inches. Lint.

K, L. Clover's inhaler with a re-breathing bag, and face pieces, numbers 4, 5, 6.

M, N. Tongue forceps. Mason's jaw gag. O. Hewitt's airways.

P. Ether measure and funnel.

Q, R. Kidney dish, towel, swabs in bowl, and empty bowl.

S, T. Hypodermic syringe and needle, adrenalin (1 in 1000), strychnine, amyl nitrite.

U, V. Cylinders of oxygen and CO<sub>2</sub> and gas bag.

The gauze is to insert into the ether mask. The gamgee tissue is for those anæsthetists who put this over the face before applying the ether mask. The vaseline is to smear on the face of the patient so that it shall not get burnt, and the

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A



B



C



D



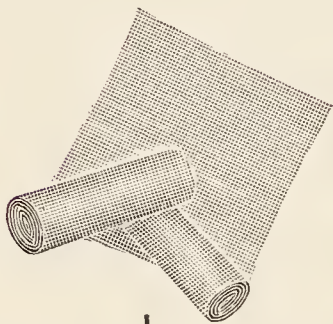
E



F



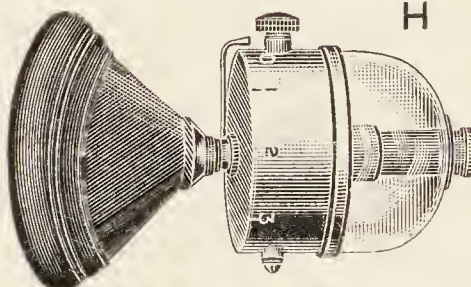
G



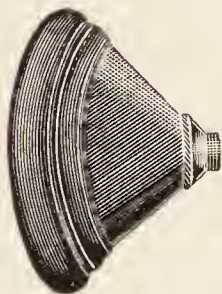
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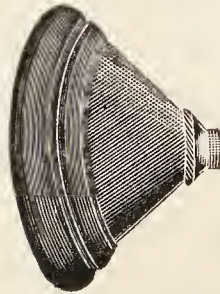
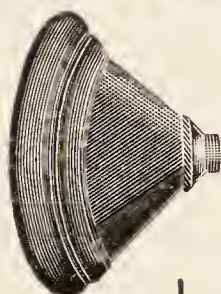
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K



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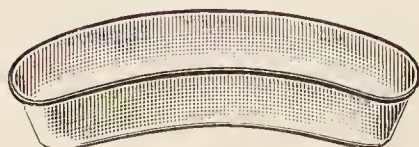
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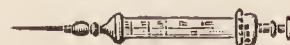
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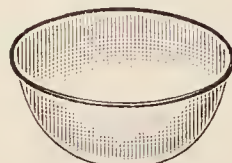
T



U



V



X



Y



Z

FIG. 70.



castor oil is to drop in the eye should a drop of ether or chloroform accidentally contaminate it.

Adrenalin, 3 minims of 1 in 1000, is injected into the heart if this organ fails. The strychnine and amyl nitrite is for cardiac or respiratory failure. The oxygen is for use if the breathing becomes a little embarrassed, or when the anæsthetist wishes to use gas and oxygen, but in many hospitals now Boyle's apparatus, or a modification thereof, is used for the administration of gas and oxygen. Many anæsthetists are now accustomed to give a dose of  $\text{CO}_2$  if the breathing becomes very shallow and at the termination of an operation. This lessens the chance of post-anæsthetic sickness.

Some new anæsthetics have now come into vogue, and the nurse will have a certain amount to do in connexion therewith. They are avertin, pernocton, and nembutal. The advantages claimed for all these drugs is that the patient is sent to sleep before she is taken to the operating theatre and does not wake up till she is back in bed again, sometime after the operation. With all these drugs ether or gas and oxygen has to be administered in addition.

### **Avertin.—**

#### *Articles for the Administration of Avertin.*

1. Glass funnel and catheter.
2. One or two pints of warm water for bowel lavage.
3. Solution of avertin ready prepared, and of correct temperature.

This drug is given per rectum. The dose is 0.2 gram for every 2 kilograms weight of the patient, so the patient has to be weighed before the solution of avertin in saline is made up. The quantity to be injected therefore varies.

1. A rectal wash out is first given.
2. The patient is then placed on an ambulance, otherwise when moved from the bed she may wake up or expel the injection.
3. The solution is injected through a catheter and glass funnel and takes on the average about fifteen minutes.
4. The nurse's duties, after the operation, are similar to

those mentioned below. After avertin patients are often restless as they are gradually waking up.

5. Dangers. Extreme restlessness afterwards.

### **Pernocton.**—

The nurse must prepare a table on which, in hospital, she must place the following articles :—

#### *Articles for the Administration of Pernocton.*

1. Ampoules of pernocton.
2. A 10 c.c. syringe and a sharp intravenous needle.
3. A tourniquet.
4. A bowl with tincture of iodine or surgical spirit.
5. Swabs in a bowl, and an empty bowl for dirty swabs.
6. Collodion and towels.

Each ampoule of pernocton contains 2·2 c.c. The dose is 1 c.c. per  $12\frac{1}{2}$  to 15 kilograms of body weight, and it is injected at the rate of  $\frac{1}{4}$  c.c. every fifteen seconds. As a matter of practice, however, while making the injection slowly the anæsthetist is guided in the dose he gives by the condition of the patient. When she falls asleep he stops the injection. As an average 1 ampoule, or a little more, is all that will be required, though some patients take 4 ampoules.

The nurse's duties after the operation are similar to those mentioned below. The special advantage claimed for pernocton is that the patients awake slowly and without the usual restlessness following the administration of other anæsthetics.

### **Nembutal.**—

The dose is 3 grains given by the mouth. The patient is placed on an ambulance, so that she shall not wake up when moved. She goes to sleep in a few minutes. The dose is given forty-five minutes before the operation. The nurse's duties after the operation are similar to those to be mentioned.

Dangers. Very careful examination of urine for two or three days after its administration, since this drug at times affects the kidneys.

Patients are nearly always very restless after they have been given nembutal, at times so restless that they have to be held down,

**Evipan.—**

This is a new anæsthetic and dissolves freely in water, but the solution is stable only for an hour or two. Its action is rapid in onset, and of short duration. It is very rapidly detoxicated. The drug is supplied in the form of a powder, and the solution, in distilled water, is run into a vein at the rate of 1 c.c. in 15 seconds, the dosage being determined by the results obtained. The average amount to induce unconsciousness is 3 c.c., and the patient is asleep in about a minute and remains so for 10 to 20 minutes.

**Spinal Anæsthesia.—**

The nurse must prepare a table on which she should place the following articles :—

1. Ampoules of stovaine 5 per cent., mixed with glucose, 2 per cent.
2. A 2 c.c. syringe and spinal needle.
3. A pair of sterilized gloves.
4. A bowl of swabs, and an empty bowl for dirty swabs.
5. Collodion and towels.
6. A hypodermic syringe, needle, and a solution of novocaine, 1 to 2 per cent. This is to inject prior to inserting the spinal needle, in nervous or very sensitive patients. Some anæsthetists give a little ether for this purpose.

**Nurse's Duties.—**

1. She must place the patient on her side with her thighs completely flexed or, according to the wishes of the anæsthetist, sitting up with her body bent as far forward as it will go. The reasons for these positions is to get the spine arched as much as possible, so that the anæsthetist will have no difficulty in inserting the spinal needle.

2. She must pull up the patient's nightgown so that the anæsthetist can decide where to insert the spinal needle and then to render the part antiseptic with the iodine or surgical spirit which should be handed to him with the swabs.

3. When the anæsthetist has inserted the needle he will withdraw the stylet, when a few drops of spinal fluid are allowed to escape. The nurse will then hand him the syringe



which has been previously filled with the solution of stovaine in the ampoule.

4. The nurse will then keep the patient's thighs flexed for so long as the anæsthetist tells her, generally for five minutes. This is done so that the stovaine may act on the spine in the lumbar region and not trickle up the spinal cord.

After the operation the nurse will keep the legs of the patient flexed and the head lower than the buttocks. This obviates headache, and in some hospitals there is a special wooden apparatus to keep the patient in this position.

5. Her other duties are similar to those to be mentioned.

Dangers. Extreme care to be taken in moving patient; everything to be done slowly; no jerky movements, they cause headache. Watch eyes very carefully for two or three days.

### **Duties of a Nurse when the Patient has been returned to her Bed.—**

The disposition of the blankets and hot-water bottles has been already dealt with.

When the patient has been returned to her bed, the nurse should acquaint herself with the condition of the pulse and respiration, and should continue to do this from time to time even after the patient has come out of the anæsthetic.

She should not leave the bedside of the patient until the latter has so far revived that she is able to make some remark of a more or less intelligent nature.

At the least sign of cardiac or respiratory trouble the nurse should inform the sister of the ward, but if the tongue of the patient has fallen back, and is partly suffocating the patient, the nurse should pull it forward with forceps if raising the jaw is not sufficient. In private the nurse should at once communicate with the doctor.

She should watch for hæmorrhage. If the dressing is slightly soaked the nurse should apply more dressing, and should on no account remove the dressing to apply clean dressing unless she wants to incur the disapproval of the surgeon. If, however, the bleeding is obviously more than slight, and the nurse can be the only judge of this, she must remove the dressing, apply new dressing and a tight bandage, and send for the sister of the ward or the doctor without any delay.

## PART XVII.

### CHAPTER XXXVII.

#### AFTER TREATMENT.

THE nurse must ascertain from the gynæcologist exactly how he wishes his patient treated after the operation, as individual surgeons have their own particular methods. The methods suggested in this chapter are the outcome of an experience of many thousands of cases, and may be followed unless the nurse has directions to the contrary.

A record should be kept for every patient, containing the pulse-rate, respiration-rate, temperature, the times the bowels have acted, the amount of sleep the patient has had, the quantity of nourishment she has taken, and, if directed so to do, the quantity of urine she has passed.

**Pulse.**—The pulse-rate should be taken every four hours and charted. The pulse is by far the most important means we have of estimating how the patient is progressing after an operation, and all nurses would be wise to practise taking it for this purpose on every suitable opportunity.

The pulse-rate is quickest for the first twelve hours after the operation, but during this time should not exceed 120 a minute. After this, as a rule, if everything is progressing satisfactorily, it falls below 100. If the pulse-rate does not fall but continues to rise, this is, as a rule, a bad sign. If the patient is suffering from shock or hæmorrhage the pulse-rate may be increased to 140 or more, becoming at times uncountable, while, in addition, in hæmorrhage the pulse is very soft and weak. Distension of the abdomen, if marked, will increase the frequency of the pulse-rate. In peritonitis the pulse-rate rapidly increases to above 120, and, its rate

gradually becoming running in character, and at the end cannot be counted. It is also hard and wiry.

**The Room.**—The room must be well ventilated and kept at a temperature of 65° F. To accomplish this there should, if necessary, be a fire in the room and the window should be a little open. Great care must be taken that the patient is not in a draught, and this may be obviated, if necessary, by a judicious arrangement of screens.

The best way to admit air through the window is to place a piece of wood 4 inches high and the breadth of the window under the bottom sash, by which means the air will pass into the room up to the ceiling between the two halves of the window.

Relatives should not be admitted unless the doctor gives permission, and following the operation the nurse must for some hours remain with the patient, so that if the nurse requires help she must summon it by bell.

**Cleaning the Instruments.**—This duty may have to be left for some little time, since the first duty of the nurse will be to attend to the patient ; meanwhile, if the surgeon wishes his instruments cleaned, the best plan is to put them into a basin and cover them with cold water.

When there is time to clean the instruments they should be well washed with cold water, soap, and soda to remove the blood-stains, after which, if necessary, they should be polished with some plate powder, and then again washed with hot water and scrubbed, all the joints being carefully examined to see that no *débris* is adhering to them ; they should then be boiled for fifteen minutes. Lysol forms a very good medium in which to wash the instruments ; it is of a soapy nature, antiseptic, and helps to polish them. If a flushing curette has been used a stream of cold water and a fine wire should be passed through its canal to remove any blood, and the instrument should then be boiled, after which a little methylated spirit, or better still, ether, run through it to prevent any rust forming.

**Cleaning the Gloves.**—The gloves are scrubbed with soap and water, inside and out, then rinsed in clean water, boiled for ten minutes, and then dried with a towel and powdered with boric acid.



**Temperature.**—The temperature should be taken under the patient's tongue every four hours and charted. The temperature must never be taken just after the patient has had a hot drink, as this may raise the temperature a degree. As a rule, in about eight hours after the operation the temperature rises to nearly  $100^{\circ}$  F. During the next twelve hours it keeps at this level, and then gradually falls to normal.

A subnormal temperature points to shock or bleeding.

A rapidly rising temperature, especially on the second day, is of very serious import, pointing as it may do to peritonitis being the cause although, if the disease is so rapidly fatal as to cause death in the first two or three days, in many cases the temperature may remain subnormal.

A persistent high temperature without any apparent cause is found on examination often to be due to a stitch abscess, or hæmatoma of the wound, while if the patient is very neurotic the temperature may rise for a few hours. In many instances a raised temperature will become normal after the bowels have been opened.

**Respiration.**—A rapid respiration-rate soon after an abdominal section may be due to shock or hæmorrhage, and later an increase in its rate may be due to massive collapse of the lung, bronchitis, pneumonia, peritonitis, or a pulmonary embolism.

The remarks under pulse, temperature, and respiration refer more particularly to patients after major operations. After minor operations the pulse, temperature, and respiration are as a rule normal.

**Sleep.**—It is important for the patient to have a proper amount of sleep after an operation, and especially if it be an abdominal one. For the first few days sleeplessness is often troublesome. The patient may be unable to sleep because of an uncomfortable position, because of noise, because of nervousness and worry, because of abdominal distension or pain.

The treatment of pain and abdominal distension is given under their respective headings. For the rest the patient should be left as quiet as possible, the room should be darkened, visitors should not be allowed, except those of the nearest relatives and then only for a very short time. If the patient

is in a nursing home all sources of noise, such as the chattering of nurses, banging of doors of rooms and the lift, rattling of articles on the kitchen floor, and so on should be avoided. A capable nurse will be able to encourage sleep by arranging the pillows suitably. Warmth and fresh air will help considerably to induce sleep, and if the patient is of a worrying disposition, medinal, grains  $7\frac{1}{2}$ , or dial, grains  $1\frac{1}{2}$ , or aspirin, grains 10, dissolved in warm water may be given.

**Thirst.**—This is a very distressing symptom, and the following methods may be tried for its relief. The mouth may be swabbed out with hot water or glycerine and borax. The patient may be allowed to wash her mouth out with hot water or a weak solution of Condy's fluid. Saline injections into the rectum, 6 ounces every four hours, will relieve the thirst to a great degree. Hot or cold tea, with or without milk, will often relieve thirst, as also will vinegar and water,  $\bar{3}$  i to  $\bar{3}$  vi, which encourages the flow of saliva. The practice followed by the author of allowing his patients, after operation, to drink as much water as they desire in small quantities has been found to abolish in most cases the troublesome symptom of thirst. Some patients find relief from sucking acid drops which encourages a flow of saliva.

Sucking ice is not a good remedy ; in most cases the relief is only momentary, the thirst increases, and flatulence results.

**Mouth.**—Great care should be taken to keep the mouth clean. This is best accomplished for the first three or four days after the operation by means of small wool swabs held in ring forceps and soaked in a solution of bicarbonate of soda, and this should be done several times a day. In addition the patient should wash her mouth out with glycothymoline or peroxide of hydrogen, and as soon as possible she should resume the cleaning of her teeth with a toothbrush.

**Tongue.**—For the first twenty-four hours following an abdominal section the tongue is generally dry and rather brown. After this it should be moist and rather white. In peritonitis and intestinal obstruction it becomes dry, brown, or red, glazed or ulcerated.

**Bladder.**—*Perineorrhaphy.*—After this operation patients rarely pass urine within twelve hours. If an extensive anterior-colporrhaphy has been performed the catheter is

passed, if the patient has not already micturated naturally, in twelve hours. After other operations many surgeons delay the passage of the catheter for eighteen hours or so, unless the patient is distressed before this. If necessary the catheter is passed thereafter every twelve hours.

*Other Minor Operations.*—There is no need for the catheter to be used.

*Abdominal Section and Vaginal Hysterectomy.*—After an abdominal operation patients rarely pass urine within twelve hours. Many surgeons prefer the passage of the catheter to be delayed for eighteen hours, unless the patient is in great pain from distension of the bladder, when the catheter should be passed at once. A capable nurse, however, can usually induce the patient to micturate before the eighteen hours. Patients in a ward, catheterized too soon after operation, easily acquire the “catheter habit” and, at times, appear unable to pass urine naturally many days after catheterization has become quite unnecessary. Unless there is retention, the catheter is not used again, except in the case of vaginal hysterectomy when clamp-forceps have been left on, and then the catheter, which must be used with the greatest care for fear of disturbing the forceps, is passed every twelve hours until they are removed.

The catheter should be used only when absolutely necessary and then at regular intervals. Frequent passage of the catheter not only increases the risk of infecting the bladder, but also makes the urethra sore, and subsequent micturition painful.

It is very important after major operations to measure the amount of urine passed, and in every case to note any abnormal constituents in it, such as blood and pus. The amount first passed after a major operation should be 4 to 5 ounces; a less amount than this implies shock, hæmorrhage, suppression of urine, or injury to the ureter, and in the latter case, or in injury of the bladder, it may be mixed with blood. If, after an abdominal section, the patient is passing her urine naturally, and the amount is less than might be expected, the catheter should be passed at the end of micturition to make sure that there is no residual urine due to partial retention.

**Bowels.**—*Perineorrhaphy.*—Liquid paraffin, a drachm three



times a day, is given till the bowels are open, usually on the fifth or sixth day. Aperients are not usually necessary.

*Other Minor Operations.*—On the second night following the operation the patient is given an aperient, and an enema the next morning if necessary, and then the bowels are kept acting as required.

*Abdominal Section and Vaginal Hysterectomy.*—On the evening of the third day after operation an aperient is given. An aperient is then administered once daily if necessary.

**Rectal Tube.**—After vaginal hysterectomy and abdominal section it may be necessary to pass the rectal tube, and perhaps to give a turpentine enema or wash out. The indication for so doing is when the intestines become distended with flatus and the pain resulting therefrom is severe. Such distension, as a rule, does not occur before twenty-four hours after the operation, any flatulence prior to this being relegated to the stomach, and for which a rectal tube is of no use. When a patient is disturbed by intestinal flatus, the passage of a rectal tube once or twice will probably suffice. In some cases it may be necessary to pass it every four hours for a day or two. It has been observed that if the aperient is given two nights before the major operation, and thereafter the bowels are not interfered with, by enema or otherwise, it is very rarely necessary to use the rectal tube.

The rectal tube has to be passed very carefully, the end being first smeared with vaseline, as it so easily becomes kinked on itself when pushed into the bowel, and should this happen it must be taken out and passed again. An X-ray examination shows that the tube can rarely be passed into the pelvic colon, because the tube usually doubles up when it reaches the upper part of the rectum, and attempts to force it further only produces a greater amount of curling. The tube must be pushed up, using ordinary care; with the tip vaselined it will go further in some patients than in others, but an average distance is about 6 inches, the total length of the tube being 31 inches. There are various patterns of rectal tube; the best is one with the hole at the end and not, like a catheter, at the side.

As a rule, very little discomfort is caused by passing the rectal tube, while when its use is indicated the relief to the

patient is often very marked. Occasionally, however, if the patient has hæmorrhoids, great distress is caused by the passage of the rectal tube, and in these cases it is best to introduce a little gall and opium ointment some time before passing it.

Having introduced the tube as far as possible, it is kept in position so long as any flatus is escaping. If flatus is not passed the tube is left *in situ* for about five minutes, its free end being kept under Condly or mercury solution in a porringer.

**Dressing.**—*Perineorrhaphy.*—The successful termination of this operation probably depends more upon the nurse than anyone else, the reason for this being the great difficulty that is experienced in keeping the wound aseptic. Practically all the failures of this operation can be traced to the wound becoming septic and breaking down superficially. In the majority of cases when this happens a good result is still obtained, the wound healing by granulation, but the convalescence is prolonged and the discomfort to the patient much increased. In a few cases the wound sloughs, and the patient realizes that after all the worry, pain, and perhaps expense have been incurred, the operation has been a failure, and will have to be repeated.

The reason the wound is so difficult to keep aseptic is apparent when its situation is remembered, since it can be so easily contaminated with fæcal matter, urine, leucorrhœa, or the menstrual flow.

Most surgeons, unless there is an offensive discharge, do not order douching in these cases. The wound area is irrigated, whenever it is soiled with urine, fæces, or the menstrual flow, with normal saline, flavine or permanganate of potash solutions. There are various methods used for dressing the wound which is done twice daily. The wet method is by irrigating with one of the solutions mentioned. The dry method is by swabbing the wound gently with dry perchloride swabs, after which it is sprinkled with a sterilized powder composed of starch, boric acid, and talcum. The wound is best irrigated by pouring the solution out of a jug.

If silk-worm gut sutures have been used they are removed on the twelfth day.

*Removal of Cysts and Tumours from the Vulva.*—The dressing is practically the same as for perineorrhaphy.

*Trachelorrhaphy.—Removal of Vaginal Cysts or Tumours.—Amputation of Cervix.*—If after these operations a piece of gauze is left in the vagina, it should be removed the next morning. The stitches are taken out on the twelfth day, unless catgut sutures have been used.

*Curetting.*—Many surgeons do not employ dressings after a curetting other than those of a pad and T-bandage. If tampons are inserted into the vagina, or the uterus has been packed with gauze because of rather free bleeding, these are removed according to the directions given, generally on the following morning. If the nurse is directed to remove the gauze she must do so very gently, as otherwise a piece may break off and be retained in the uterus.

Although the nurse, if present at the operation, should note that packing, or a swab, has been left in the vagina, it is the duty of the surgeon to call her attention to the fact. The nurse will then have no excuse to offer if she neglects to remove the packing or swab the next morning. Such forgetfulness has often occurred, with the result that the surgeon is very puzzled because the patient has a most offensive discharge, and perhaps a rise of temperature. It is only when the surgeon orders a douche to be given in such circumstances that the presence of the packing, or swab, is detected.

*Vaginal Hysterectomy.*—If, during a vaginal hysterectomy, gauze has been inserted into the pouch of Douglas it is left there for thirty-six hours. After its removal the surgeon may order the nurse to cleanse carefully the lower part of the vagina every four hours with a swab of absorbent wool soaked in some antiseptic and held in a pair of ring forceps.

Supposing clamp forceps have been left on, the nurse must be very careful that the patient does not interfere with them, especially when recovering from the anæsthetic, and she must also be very careful when catheterizing, or otherwise attending to, the patient for fear of detaching them.

*Abdominal Hysterectomy.*—As a rule the dressing, if used, need not be renewed until the fifth day, when the stitches or clips are taken out. A fresh supply of dry dressing must then be ready. If the surgeon wishes to strap the wound after the stitches or clips have been removed, some long strips of adherent plaster, about 2 inches broad and 12 inches long must be prepared.



If a rubber tube has been left in the abdominal cavity, for the purposes of drainage, it will be necessary to change the dressings when they get soiled by the blood or discharge. The tube is, as a rule, removed on the day after the operation if it was used to evacuate any blood that may have oozed, but if it has been inserted because of the presence of pus in the operation-site, then the time for its removal will vary according to the nature of the case. As a general rule it will not be disturbed for five days, after which it will be removed altogether, shortened, or reduced in size. It is as well to give the tube a turn when dressing the wound; this will prevent it sticking and so make it easier to withdraw.

The author has not used an abdominal dressing or binder, except when a drainage tube has been inserted, for many years. After the clips have been inserted the nightgown is pulled down and the patient removed to her bed. It might be thought that the wound would become septic but it does not, and the patient having perhaps touched it once is not inclined to do so again. Apart from the great saving of expense to hospitals, of binders and dressings, patients are far more comfortable without the heat and tension of the binder and the chafing of the retaining straps against the thighs to keep the binder from slipping up. The idea was suggested to the author by one of the sisters of the hospital upon whom he performed a hysterectomy. Having suffered from the binder and dressing after a previous appendicectomy she asked to be allowed to dispense with these contraptions, and asserted that the difference in comfort was remarkable.

If, however, the patient has severe vomiting, a binder is applied till the vomiting ceases.

Some surgeons having inserted silkworm gut, retaining sutures, leave their ends long after tying them, place a thick roll of gauze along the incision and tie the sutures over it. This method is more likely to prevent the formation of a hæmatoma in the wound.

**Douching.**—The douches generally used are tincture of iodine one drachm to a pint of hot water, biniodide of mercury, 1 in 4000, lysol or monsol one drachm to a quart.

*Perineorrhaphy*—*Operations on the Vulva, Vagina, Cervix, and Curetting.*—Apart from the irrigation of the vulva referred

to, most surgeons prefer to keep the wound dry and clean by swabbing with some antiseptic, unless the discharge becomes very offensive when iodine douches will be ordered. If the surgeon requires his patient to be douched the nurse must ascertain how often this is to be done and what disinfectant is to be used. As a rule, twice a day is considered sufficient.

*Vaginal Hysterectomy.*—About the tenth day, after vaginal hysterectomy, the discharge, in most cases, commences to be offensive. This is due to a little sloughing of the injured parts and to separation of the ligatures. It is then customary for the surgeon to order a vaginal douche twice daily. If a douche is ordered it must be given with very gentle pressure, the douche-can being held but very little higher than the patient.

*Abdominal Section.*—After abdominal section douches are not ordered. In some cases after a total abdominal hysterectomy an offensive discharge will appear during the second week, due to separation of the ligatures. If so, the surgeon may order a vaginal douche, when the same care should be taken.

**Food.**—*Perineorrhaphy.*—On the supposition that the patient is being given liquid paraffin, so soon as vomiting, if present, ceases, the patient is allowed to take as much fluid as she likes (which incidentally helps to prevent retention of urine), and she may have a light diet before the bowels are open.

*Other Minor Operations.*—Eight hours after the operation the patient is given 4 ounces of tea and milk or hot milk and water. The patient then returns to a normal diet.

*Major Operations.*—See next chapter.

## CHAPTER XXXVIII.

### ABDOMINAL OPERATIONS.

#### Time-Table for Nursing and Feeding a Patient after an Abdominal Operation as used by the Author.

| Hour.     | Directions.  | Nourishment.  |
|-----------|--|---|
|           | FIRST DAY.   |   |
| 5 a.m.    |  | Chicken-tea. Cup of tea, bread and butter, rusk or biscuit.   |
| 8.40 a.m. | Hypodermic injection of morphia gr. $\frac{1}{4}$ , atropine gr. $\frac{1}{120}$ , or scopolamine gr. $\frac{1}{100}$ , atropine gr. $\frac{1}{120}$ , heroin gr. $\frac{1}{12}$ .   |   |
| 8.45 a.m. | Catheter.  |   |
| 9 a.m.    | Operation. When the patient is returned to bed she must be covered with a warm blanket, and hot bottles should be removed from the bed, unless otherwise directed. A pillow should be placed under the patient's knees, a cradle over her abdomen, and her head is to be kept low. If retching or sickness supervenes the patient is to be turned slightly on her left side and her abdomen is to be supported by the nurse laying the flat of her hands on each side of the stitches. | If the operation is at 2 p.m. tea and bread and butter will be given at 6 a.m. and beef-tea at 10 a.m. The catheter will be passed at 1.45 p.m. and the hypodermic injection at 1.40 p.m. |



| Hour.        | Directions.  | Nourishment.  |
|--------------|--|---|
| 2 p.m.       | Pulse, respiration, temperature. If shock is present a rectal injection of saline solution with glucose $\mathfrak{z}$ i should be given every two hours, to which brandy may be added if necessary. If the patient is unconscious a pint of saline can be given. When conscious 6 to 10 ounces will probably be all she can retain. If the patient complains much of pain when she has recovered from the anæsthetic a rectal injection of aspirin gr. 20, in saline $\mathfrak{z}$ vi, may be given. |   |
| 6 p.m.       | Pulse, respiration, temperature. Measure urine when passed ; for directions as to catheter see page 400. Patient may have one or two pillows.  | If there is little or no sickness drinks of cold water may be given as much as the patient desires. |
| FIRST NIGHT. |  |   |
| 8 p.m.       | If the aspirin fails to relieve the pain, a hypodermic injection of morphia, gr. $\frac{1}{4}$ , to be repeated if necessary, may be given. It is best if possible to postpone the administration of morphia till late in the evening, so as to ensure, if possible, the patient having a good night. Morphia should not be given after the first night, unless absolutely necessary, as it causes flatulence and is apt to mask important symptoms.   | A cup of tea may be given, unless the patient prefers lemon water.                                  |
| 10 p.m.      | Pulse, respiration, temperature.   |   |
| 2 a.m.       | Pulse, respiration, temperature.   |   |

| Hour.               | Directions.   | Nourishment.   |
|---------------------|---|--|
|                     | SECOND DAY.   |  |
| 6 a.m.              | Pulse, respiration, temperature.  |  |
| 7 a.m. to<br>9 a.m. | The patient's hair to be brushed and plaited. Her hands, face, shoulders, and lower part of her back to be washed. The back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Mouth to be cleansed. Draw-sheet and top-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed to be entered in the report book. If the patient passes only a small quantity of urine the catheter must be passed to ascertain if there is any residual urine, and if so the catheter must be used till practically all the urine is naturally evacuated. | Cup of tea and milk with a biscuit or bread and butter.  |
|                     | The patient should be placed in Fowler's position unless there is any contra-indication.  |  |
| 10 a.m.             | Pulse, respiration, temperature.  | During the day a glass of milk and soda or barley water or plain water may be given from time to time, as desired, or chicken-tea or beef-tea. |
| 2 p.m.              | Pulse, respiration, temperature.  |  |
| 4 p.m.              | During the second day flatulence may become troublesome and painful. It is at first felt in the   | Cup of tea and milk with bread and butter.   |

| Hour.   | Directions.  | Nourishment.   |
|---------|--|--|
|         | <p>stomach when small drinks of hot water with a few drops of essence of peppermint may relieve it. Later, as the intestine becomes distended, the flatulence is best relieved by passing the rectal tube to allow of the escape of flatus, and if this does not afford relief, a turpentine enema or rectal wash-out should be given before the rectal tube is withdrawn. These measures may be repeated if necessary every four hours.</p> |  |
| 6 p.m.  | Pulse, respiration, temperature.   |  |
| 7 p.m.  | <p>The patient's hair to be brushed and plaited. Her hands, face, shoulders, and lower part of her back to be washed. The back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Mouth to be cleansed. Draw-sheet and top-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.</p> <p>SECOND NIGHT.</p>   |  |
| 10 p.m. | <p>Pulse, respiration, temperature. Mouth to be cleansed.</p>  |  |
| 11 p.m. | Aspirin gr. 10.  | Drinks of milk and soda or milk and barley water during the night if wished for. |
| 2 a.m.  | Pulse, respiration, temperature, if patient is awake.  |  |
|         | THIRD DAY.   |  |
| 6 a.m.  | Pulse, respiration, temperature.   |  |



| Hour.               | Directions.   | Nourishment.   |
|---------------------|---|--|
| 7 a.m. to<br>9 a.m. | The patient's hair to be brushed and plaited. Her hands, face, shoulders, and lower part of her back to be washed. The back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Mouth to be cleansed. Draw-sheet and top-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.              | Cup of tea and milk. Bread and butter. Boiled egg, if patient would like it. |
| 10 a.m.             | Pulse, respiration, temperature.  | Milk, beef-tea, or chicken broth.  |
| 1 p.m.              |   | Fish, calf's-foot jelly or custard.  |
| 2 p.m.              | Pulse, respiration, temperature. Mouth to be cleansed, wash hands and face.   |  |
| 4 p.m.              |   | Cup of tea and milk, bread and butter, jam or cake.                          |
| 6 p.m.              | Pulse, respiration, temperature.  |  |
| 7 p.m.              | The patient's hair to be brushed and plaited. Her hands, face, shoulders, and lower part of her back to be washed. The back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Mouth to be cleansed. Change draw-sheet and top-sheet. The amount of nourishment taken, sleep obtained, and urine passed to be entered in the report book. Aperient given. | Milk or soup.  |
| THIRD NIGHT.        |   |  |
| 10 p.m.             | If the patient is progressing normally omit four-hourly temperature, respiration, and pulse, and take these only twice daily, morning and evening.  |  |

| Hour.            | Directions.  | Nourishment.  |
|------------------|--|---|
|                  |  | Drinks of milk, water or barley water during the night if wished for. |
|                  | <b>FOURTH DAY.</b>   |   |
| 6 a.m.           | If the aperient fails to act a saline aperient is given. If the patient is in pain, 1 c.c. of pituitary extract may be ordered.  |   |
| 7 a.m. to 9 a.m. | The patient's hair to be brushed and plaited. Her face, hands, shoulders, and lower part of back to be washed. The back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Draw-sheet and top-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed to be entered in report book.   | Cup of tea and milk, bread and butter, boiled egg.                    |
| 10 a.m.          | Pulse, respiration, temperature.   | Milk, beef-tea or chicken broth.                                      |
| 1 p.m.           |  | Fish, custard pudding, piece of bread.                                |
| 4 p.m.           |  | Cup of tea and milk, bread and butter, jam, cake.                     |
| 6 p.m.           | Pulse, respiration, temperature.   |   |
| 7 p.m.           | The patient's hair to be brushed and plaited. Her face, hands, shoulders, and lower part of back to be washed. Her back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Draw-sheet, top-sheet, and bottom-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed, and the number of times the bowels have acted to be entered in report book. | Rabbit, chicken or mince, custard pudding, bread or biscuit.          |

| Hour.            | Directions.  | Nourishment.  |
|------------------|--|---|
|                  | FOURTH NIGHT.  |   |
|                  |  | Drinks of milk, water, or barley water during night if necessary. |
|                  | FIFTH DAY.   |   |
| 7 a.m. to 9 a.m. | The patient's hair to be brushed and plaited. Her face, hands, shoulders, and lower part of her back to be washed. Her back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Mouth to be cleansed. Draw-sheet, top-sheet, and bottom-sheet to be changed. The amount of nourishment taken, sleep obtained, and urine passed, and the number of times the bowels have acted to be entered in report book. |   |
| 8 a.m.           |  | Cup of tea and milk, bread and butter, boiled egg.                |
| 10 a.m.          | "Michel's" clips to be removed and the abdominal wound to be then painted with the iodine solution. If dressings have been used, these to be renewed. Pulse, respiration, temperature.   |   |
| 1 p.m.           |  | Lunch.  |
| 2 p.m.           | Mouth to be cleansed. Wash hands and face.   |   |
| 4 p.m.           |  | Tea.  |
| 6 p.m.           | Pulse, respiration, temperature.   |   |
| 7 p.m.           | The patient's hair to be brushed and plaited. Her face, hands, shoulders, and lower part of her  | Dinner.   |



| Hour.            | Directions.  | Nourishment.   |
|------------------|--|--|
|                  | <p>body to be washed. Her back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. The patient may be lifted into another bed or sofa while her mattress is being turned. Draw-sheet and top-sheet to be changed. Mouth to be cleansed. The amount of nourishment taken, sleep obtained, and urine passed, and the number of times the bowels have acted to be entered in the report book.</p> <p>FIFTH NIGHT.</p>  |  |
| 7 a.m. to 9 a.m. | <p>The patient's hair to be brushed and plaited. Her face, hands, shoulders, and lower part of her body to be washed. Her back and shoulders to be rubbed with eau-de-Cologne, or spirit, and boric powder. Draw-sheet and top-sheet to be changed. Knee-pillow to be removed. The amount of nourishment taken, sleep obtained, and urine passed, and the number of times the bowels have acted to be entered in report book.</p> <p>SIXTH DAY.</p> <p>The pulse, respiration, and temperature are to be taken twice daily, and the patient is thereafter attended to as before.</p> <p>SEVENTH DAY.</p> | <p>Diet as before, and mutton may be substituted for chicken.</p> <p>For this and the following days the ordinary diet may be renewed.</p> |

| Hour. | Directions.  | Nourishment. |
|-------|--|--------------|
|       | <p>TENTH DAY.</p> <p>If silk-worm gut retaining through-and-through sutures have been used, they should be removed on this day.</p> <p>FOURTEENTH DAY</p> <p>Patient is lifted on to a couch.</p> <p>FIFTEENTH DAY.</p> <p>Patient may walk about, and have a bath.</p> <p>EIGHTEENTH DAY.</p> <p>Patient goes home.</p> |              |

This table is meant to serve as a guide only in normal cases, and the nurse should always ascertain from the surgeon how he wishes his patients to be treated after the operation.

If post-anæsthetic sickness is troublesome, nourishment will have to be given more cautiously, or even withheld for a time.

**Belts.**—Many surgeons prefer their patients to wear abdominal belts, for some time after they get up. Other surgeons never advise their use. It is doubtful whether the use of an abdominal belt lessens the chance of a ventral hernia supervening, since as many ventral herniæ occur in patients who wear belts as in those who do not. Some patients, however, feel more comfortable with such a support. In such cases a properly fitting pair of corsets is probably better than a belt.

**Getting up.**—After abdominal operations or vaginal hysterectomy, the patient may get out of bed on the fourteenth day and leave the nursing home or hospital on the eighteenth. If the patient has suffered from much loss of blood before the

operation, or has otherwise been ill, it will be wiser to keep her in bed a month.

After the operation of colpo-perineorrhaphy many surgeons keep the patient in bed twenty-one days.

After other minor operations the patient may get up on the seventh day and leave on the tenth.



## PART XVIII.

### CHAPTER XXXIX.

#### NURSING OF COMPLICATIONS.

THE nurse should report to the doctor as soon as possible any complication occurring after an operation.

The most common complications met with after an abdominal section are: thirst, pain, sleeplessness, vomiting, and distension. Among the rarer complications are shock, hæmorrhage, peritonitis, intestinal obstruction, cystitis, venous thrombosis, pulmonary embolism, and those relating to the abdominal wound.

**Pain.**—Patients complain of pain in their back, and abdomen at the site of the incision, on the night of the operation. The pain in the back is due, principally, to the arching of the back resulting from the Trendelenburg position, and can be to some extent obviated by placing a pillow under the small of the back when the patient is placed in this position. The pain can also be relieved by inserting a pillow under the legs of the patient when she is returned to her bed, which procedure allows the back to lie flat on the bed, and not arched, as is otherwise the case. Pain in the back can also be relieved by placing a small air-cushion or pad under it, and by allowing the patient to lie on her side, but most patients having tried this position prefer the dorsal one.

The surgeon will probably leave directions that if, in the early hours after the operation, the pain becomes unbearable, the following mixture should be given per rectum. Potassium bromide, grains 40; aspirin, grains 30; brandy  $\bar{5}$  ss., saline solution,  $\bar{5}$  vi. Later, and during the night, an injection of morphia may be necessary. It is a better plan to give two small dozes, say  $\frac{1}{6}$  grain at intervals, rather than a

larger one, as the second dose may not be required. If morphia is known to disagree, an injection of heroin,  $\frac{1}{12}$  grain, can be given in its stead. After the first night morphia is contra-indicated, since it favours distension, and masks peritonitis and obstruction.

If the patient is very neurotic, throwing herself about and complaining of the greatest agony, although an examination shows that the temperature and pulse are normal, and that distension of the abdomen and sickness are absent, an injection of  $\frac{1}{3}$  to  $\frac{1}{2}$  grain of morphia is of the greatest value, and will quiet her at once.

**Sleeplessness.**—It will depend upon the effect of the morphia injection what amount of sleep the patient gets the first night. Some patients sleep several hours at a stretch, others for short periods at a time only, although they may not be in much pain. After the scopolamine, atropine, and heroin injection given before the anæsthetic, patients will often sleep well on into the afternoon following their operation. Sleeplessness after the first night can be treated on the lines stated on page 398.

**Vomiting.**—This may be due to the anæsthetic, to gastritis, to neurosis, to peritonitis, or to obstruction of the bowels.

*Anæsthetic Vomiting.*—This comes on early, and lasts, as a rule, about twenty-four hours. It is very often more of a trying to be sick than actual vomiting, and in many patients appears to be made worse by the smell and taste of the anæsthetic. The patient retches a good deal, and when she does bring up anything it is only a small quantity, a drachm or so at a time, and light green in colour. There is not any tenderness of the abdomen, or fever, or increase in the pulse-rate. Anæsthetic vomiting is often associated with flatulent distension, and may be treated by making the drinks colder or hotter, by peptonizing the milk, or by giving a draught containing—

|   |                       |   |   |   |   |           |
|---|-----------------------|---|---|---|---|-----------|
| R | Bicarbonate of soda   | . | . | . | . | 1 drachm  |
|   | Essence of peppermint | . | . | . | . | 5 minims  |
|   | Warm water            | . | . | . | . | 10 ounces |

which generally makes the patient very sick, and so really washes out the stomach. Other remedies are a minim of

tincture of iodine in a drachm of water every half-hour or so, pine-apple juice, very strong coffee, or an ice-bag to the epigastrium. Inhalation from a handkerchief wrung out of pure vinegar is, in many cases, very comforting.

If these remedies fail, the condition can always be cured by putting the patient on rectal feeding for a few hours.

Another method of treatment is to wash out the stomach. If the surgeon elects to do this the nurse must prepare 2 or 3 quarts of boric, or saline solution, at a temperature of  $105^{\circ}$  F., as the solution will be used until it returns quite clean. It is stated that the inhalation of  $\text{CO}_2$  immediately after the operation is a good deterrent in this class of vomiting.

*Irritative Vomiting.*—This is due to gastritis set up by the anæsthetic. Although the stomach rejects anything that is put into it, if it is left alone vomiting is not so likely to occur. Irritative vomiting is often associated with gastric flatulence. It is best treated by withholding all food by the mouth for some hours and giving saline injections containing 5 per cent. glucose in its stead. A soap and water enema will at times stop this variety of vomiting at once. As a rule irritative vomiting does not last more than twenty-four hours. The pulse-rate and temperature are normal and there is not any abdominal tenderness.

*Neurotic Vomiting.*—The patient is continually retching, whether there is anything in her stomach or no ; she appears to be trying to be sick. An examination of the pulse-rate, temperature, and abdomen fails to disclose any abnormal condition. Neurotic vomiting, which may last for some days, is often accompanied by complaints of great agony and by excitement and lack of sleep. The various remedies already mentioned may be tried, and in very excitable patients an injection of  $\frac{1}{3}$  grain of morphia will often prove to be the most successful remedy.

*Peritonitic Vomiting.*—This comes on during the second or third day, the ejected fluid is dark green or brown in colour, and sometimes offensive, while the amount may be very considerable, the patient vomiting as much as half a pint at a time. With it there is no feeling of sickness or effort to eject the vomited fluid as in the case of irritative vomiting ; the fluid simply wells up and runs out of the mouth. The



other signs and symptoms which accompany peritonitis are also, as a rule, so evident that a mistake cannot be made as to the significance of this variety of vomiting. The treatment is that for peritonitis.

*Obstructive Vomiting.*—This is due to some portion of the gut having become accidentally included in a ligature during the operation, or to adhesions forming among the intestines or omentum after the operation, or to the gut becoming adherent to the stump after a hysterectomy.

This variety of vomiting, which comes on gradually at first and only at intervals, continues to increase in frequency, till at the last it is practically continuous. Although fæcal vomiting is said to be diagnostic of it, the ejected material often does not become fæcal in character till the end is at hand, and on many occasions it does not become fæcal at all.

Obstructive vomiting is always accompanied by abdominal distension, which gradually becomes more and more marked, commencing, as a rule, over the left abdomen, as it is here, in the region of the sigmoid flexure, that the obstruction generally takes place.

The treatment is operative to relieve the obstruction.

**Retention of Urine.**—After any gynæcological operation, and especially after the radical operation for carcinoma of the cervix, the patient may be troubled with retention of urine. The treatment of this complication after the radical operation is dealt with on page 430. Other methods of treatment are detailed on page 132.

**Abdominal Distension.**—Propping the patient in Fowler's position often relieves distension, and unless the contrary is ordered the nurse should always place the patient in this position the morning after the operation.

*Gastric Distension.*—This is due to the irritation of the anæsthetic, and may be treated by the administration of essence of peppermint ℥ 5, in water ʒ ii; ol. cajuput ℥ iii on a lump of sugar, or by placing a hot-water bottle on the epigastrium.

*Intestinal Distension.*—Post-operative distension of slight degree is not an uncommon condition, especially when the operation has been at all prolonged and there has been much handling of the intestines. The distension, which is due to

loss of tone in the bowel-walls, is uniform and soft ; there is not any tenderness or colicky pain or rigidity of the abdominal walls or visible intestinal movements. The distension may be treated by the frequent use of the rectal tube, by a turpentine, ox gall, or rue enema, by a rectal wash-out, or by a rectal injection of an ounce of essence of peppermint in a pint of water.

Post-operative distension is also, in many cases, very successfully treated by injections of pituitrin  $\frac{1}{2}$  c.c.

A severe form of intestinal distension, but rare, is known as paralytic ileus, and usually supervenes about the fourth day after the operation. The symptoms and signs resemble, in some respects, those of intestinal obstruction or peritonitis. If the complication is not relieved the patient will die, and death is not an uncommon ending. Tyrrell Gray, who has written largely on the subject, considers that the application of heat is one of the most important factors in the treatment. The surgeon will, therefore, order radiant heat baths every six hours for twenty minutes, pituitrin, turpentine, gall or rue enemata gastric lavage (if the stomach is dilated) and, if the patient does not vomit, paraffin will probably be ordered, as well as camphor or coramine if the heart is failing. Rectal injections of saline and glucose are indicated. If improvement does not result, the surgeon, as a last resort, may perform jejunostomy, or ileo-colostomy and cæcostomy, which is but rarely successful.

*Turpentine enema* :—

A good recipe for a turpentine enema is that used at the Middlesex Hospital :—

|                 |   |   |   |   |   |                      |
|-----------------|---|---|---|---|---|----------------------|
| Turpentine      | . | . | . | . | . | $\frac{1}{2}$ ounce. |
| Castor oil      | . | . | . | . | . | 1 ounce.             |
| Soap and water  | . | . | . | . | . | $\frac{1}{2}$ pint.  |
| Water and gruel | . | . | . | . | . | $\frac{1}{2}$ pint.  |

It is made as follows, the enema being injected as warm as possible : Either by mixing the turpentine in a porringer with a piece of soft soap as large as a hen's egg, then stirring in the oil, and adding the remaining ingredients last, or by beating up the turpentine with the white of an egg, and then stirring in the ingredients.

*Rue enema* :—

|                    |   |   |   |   |   |            |
|--------------------|---|---|---|---|---|------------|
| Oil of rue         | . | . | . | . | . | 20 minims. |
| Mucilage of acacia | . | . | . | . | . | 2 drachms. |
| Soap and water to  | . | . | . | . | . | 6 ounces.  |

In either case, if the enema is not returned the rectal tube is passed to draw it off.

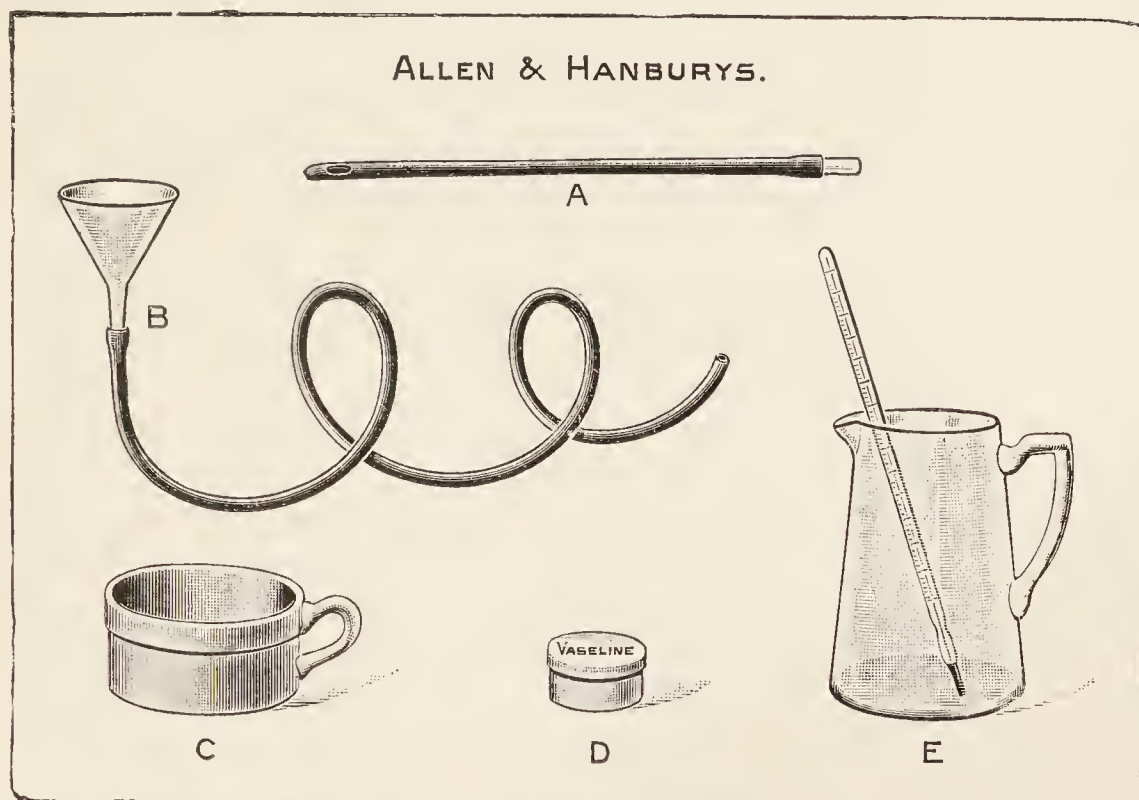


FIG. 71.—APPARATUS FOR GIVING A RECTAL WASH-OUT.

- A. India-rubber catheter and glass joint.
- B. Glass funnel and tubing.
- C. Porringer for swabs.
- D. Vaseline.
- E. Glass or enamel measure with thermometer.

*Ox gall solution enema* :—

Six ounces of ox gall solution heated by placing the bottle containing it in hot water, and then injecting the ox gall into the rectum, often affords great relief.

*Rectal Wash-out.*—To give a rectal wash-out a catheter with a glass funnel and tubing fitted to its end by a glass joint are required. It is important before inserting the tube to drive the air out of it. Some of the fluid therefore should be run through the tube which should then be pinched



just below the glass funnel, before the latter is quite empty. Two pints of soap and hot water containing 1 ounce of turpentine are then made up, and 6 ounces of this solution are poured into the funnel, which is held as high as possible. The solution is then allowed to remain in the rectum for a few minutes, after which the funnel is lowered into a basin of water and the solution allowed to run out with a consequent aspiration of flatus from the intestine. This is repeated till the 2 pints are used up. It is important that a siphonage action should be established, by not emptying the funnel before it is lowered to withdraw the bowel contents. As a rule, this method of treating the distension is very successful (Fig. 70).

A word of warning is here necessary concerning the method of giving a rectal enema for any purpose. The nurse should never insert the bone nozzle of the enema syringe into the rectum, but should attach the india-rubber tubing provided for this purpose to the bone nozzle first. The neglect of this simple precaution, due to sheer carelessness, has resulted, more often than has been reported, in the bone nozzle being forced through the lower end of the rectum and the douche being pumped into the cellular tissue around it until the great pain experienced by the patient forces the nurse to desist. The author lost a patient in these circumstances, when she was convalescent from a radical hysterectomy.

*Peritonitic Distension.*—There is great abdominal pain, the walls are very rigid, and the patient soon becomes collapsed. As a rule, treatment is of no avail, but rectal wash-outs and enemas afford the best means of relief. Patients suffering from this form of distension will often pass flatus with the tube, but not naturally, till the end.

*Obstructive Distension.*—The abdomen is hard and tender. The pulse-rate and temperature increase and vomiting is persistent. Since in pelvic surgery the obstruction is more partial than complete, the symptoms are sub-acute, and it may be several days before the patient dies. The distension probably passes from the large intestine to the small intestine, and, if the obstruction is incomplete, flatus may be passed and even small portions of fæcal matter. The abdominal pain is intermittent and colicky and intestinal movements

are excited by palpation of the abdomen. The only treatment is to relieve the obstruction by operation.

**Shock—Hæmorrhage.**—These two complications will be dealt with together because, to the inexperienced eye, there is a certain resemblance between them, and even the trained observer may occasionally be in great doubt as to which of the two the patient is really suffering from, especially when much blood has been lost at the operation, since such a loss is itself a cause of shock. A great responsibility devolves upon the nurse, however, with respect to these two conditions, since she will have the first opportunity of diagnosing them, and her failure to send for the surgeon when the patient is bleeding may result in the patient's death, whereas by an early intimation many a life has been saved.

It will be better to take the signs separately and compare them.

*Shock.*

Signs date from the operation.  
Signs tend to get better.  
Face may be blanched.  
  
Pulse-rate fast, 140, may at times be slow.  
Patient is quiet.  
Respirations are quick and shallow.  
Does not as a rule feel faint.  
Stimulants improve shock.  
Abdominal pain absent.  
Temperature may be subnormal  
Duration and severity of the operation of special significance.

*Hæmorrhage.*

Signs develop after the operation.  
Signs tend to get worse.  
Face and lips are markedly blanched.  
Pulse-rate fast, 140, and feeble.  
Fast pulse nearly always.  
Patient is very restless.  
Respirations are sighing and gasping.  
Always feels faint.  
Stimulants increase hæmorrhage.  
Severe abdominal pain.  
Temperature as a rule subnormal.  
Duration and severity of the operation of no special significance, unless it is known that much blood had been lost.

TREATMENT.—

In cases of shock the foot of the bed should be raised on blocks and hot-water bottles, or an electric cradle applied. An enema containing 1 ounce of brandy and 10 ounces of hot saline, and a hypodermic injection of strychnine gr.  $\frac{1}{60}$ , or an injection of camphor gr. 30 will be of great service, and may be repeated if necessary. If the patient does not improve

with these measures, a saline infusion of two or three pints should be at once administered.

If possible the surgeon will take the blood pressure and be guided in his further treatment thereby. He may order coramine 1 c.c. three times a day for two days. In cases of hæmorrhage the only treatment of any avail is for the bleeding point to be exposed and tied.

While the surgeon is operating, the nurse, if she has not done so before, will have to get ready the saline solution for infusion or injection unless a blood transfusion has been arranged. *If the nurse suspects hæmorrhage she should never stimulate the patient.*

Shock may be due to insufficient protection of the intestines during an abdominal operation. Thus if they project through the wound the surgeon will require sterile towels soaked in warm saline solution to cover them. Shock may also follow a prolonged operation with its attendant anæsthesia, to dragging on the intestines, to loss of heat, so that the temperature of the operating room should be between 65° F. and 70° F. It may also be due to the loss of blood or to a combination of the loss of blood with one or more of the other factors mentioned.

**General Peritonitis.**—This, the most frequent cause of death after abdominal section or vaginal hysterectomy, is caused by septic infection of the peritoneum. This may be due to some flaw in the aseptic technique, and on the occurrence of peritonitis the strictest inquiry must be made into the various details connected with the operation in order that the source of the infection may, if possible, be discovered and so danger, in this respect, to other patients undergoing operation prevented.

Every case of peritonitis, however, is not due to faulty technique. It may be that the abdominal tumour is already infected before an operation for its removal takes place, or during the operation some pus, which has been locked up in an abscess, may be disturbed and soil the peritoneum.

The appearance of general peritonitis is gradual, and, as a rule, the symptoms and signs do not become marked until the third day. It will be noticed that the pulse-rate does not fall in the usual way but continues to rise so that it reaches 120 or over. The temperature in most cases rises rapidly.



The respirations increase and the tongue becomes dry. Vomiting now supervenes, the vomited matter, which is green or dark brown in colour, being ejected without any effort or feeling of nausea. The amount vomited at a time may be considerable and the stomach cannot tolerate any solid or liquid. With the vomiting there is associated marked abdominal distension, the walls of the abdomen are extremely rigid and it is greatly tender. The patient complains of agonizing pain, and lies with her legs flexed to relieve the pain caused by tension of the abdominal muscles if the legs are kept straight. There is, as a rule, constipation, the breathing is thoracic, and hiccough is often troublesome from the first. In very rapid and fatal cases the temperature may fall below normal, and there is not any pain or tenderness to speak of.

There are many channels by which a patient may become infected, but the greater the care that is taken in making everything connected with the operation as aseptic as possible, so much the less chance will there be of peritonitis supervening; in fact, peritonitis, from being in the past the commonest complication seen after abdominal section, has nowadays become probably the rarest.

**Intestinal Obstruction.**—Intestinal obstruction after an abdominal section may be due to adhesion of a loop of intestine to the pedicle remaining after the removal of a diseased ovary or Fallopian tube, or to the stump of a hysterectomy. A piece of intestine may be included in a ligature. Some other causes are adhesions forming between different portions of intestine or between intestine and the omentum, and a knuckle of intestine forcing its way through the fascial incision in the abdomen and remaining undetected.

A patient suffering from intestinal obstruction has colic and intermittent pain of great severity, which is more particularly aroused by abdominal palpation, or eating and drinking. The pain most often starts in the left iliac region, as this is the commonest site of the obstruction. The abdominal muscles are rigid, there is marked abdominal distension, and palpation often excites intestinal movements. Although in the early stages flatus may be passed by the rectal tube, this soon ceases. The patient will vomit quite apart from taking anything into her stomach or not, though she may retain

food for several hours before returning it. Towards the end the vomiting is continuous. The vomit becomes brown and in some cases is fæcal. The pulse-rate is markedly quickened, as a rule there is no fever but the temperature may be subnormal.

**Pyelitis.**—See page 210.

**Cystitis.**—About the end of the second week after a vaginal hysterectomy or an abdominal section the patient may complain of pain on micturition. If the infection is due to the bacillus coli, as it generally is, the urine is found to be acid and to contain a little pus. Large drinks of lemon or barley water should be given, and after the urine has been made quite alkaline by doses of bicarbonate of soda, salol, or urotropin in doses of 10 grains, with acid sodium phosphate 30 grains and water to an ounce three times a day, will, as a rule, effect a cure. The cystitis, however, may be due to some other organism when the urine will be alkaline and ammoniacal, in which case the cystitis will have to be treated by washing out the bladder (see p. 274).

**Femoral Thrombosis.**—About the thirteenth day after the operation the leg becomes swollen and very painful. The swelling may be limited to the lower part of the leg, or the whole leg may be affected. This swelling pits on pressure, and the hard, tender thrombus can be felt in the femoral vein.

There is, as a rule, tenderness over the femoral vein, and because of the pain the patient is unable to move her leg. The temperature will be somewhat raised. The leg generally remains in this condition for a few days, and then gradually gets better, although in some cases it remains permanently swollen.

Femoral thrombosis may occur after any operation and, as a rule, the left leg is affected.

The surgeon will direct the nurse to paint the leg with a solution of glycerine and belladonna, and to apply over this a warm fomentation, and a bandage. The leg should be rested on a pillow, a cradle put over it, sand-bags should be placed each side, while the nurse will be warned to prevent the patient moving her leg. The great danger of femoral thrombosis is that the clot in the vein or part of it, on account of some movement, may get loose and escape into the cir-

culatation, causing pulmonary embolism, and because of this danger the leg must be kept perfectly at rest.

**Pulmonary Embolism.**—This condition is due to a clot of blood (thrombus) becoming detached from some vein. The clot is then carried with the circulating blood to the heart and may block the pulmonary artery through which the blood is conveyed to the lungs to be aerated. This complication is known as a pulmonary embolism. If the pulmonary artery is entirely blocked the patient dies practically suddenly. If partially blocked, death may be slower, or the patient may recover. If death is not sudden the patient experiences the greatest difficulty in respiration. She will sit up in bed, gasp, struggle to get her breath, throw her arms about, and the colour of her face, at first blue, gradually becomes grey. The nurse should administer brandy, and oxygen if any is available, and a hypodermic injection of morphia gr.  $\frac{1}{4}$  to relieve the distress. If the patient stops breathing, artificial respiration should be performed.

**Complications of the Abdominal Wound.**—The abdominal wound may be the seat of a hæmatoma or of an abscess. It may slough, it may be the seat of a sinus, and rarely it may burst.

*Hæmatoma.*—A hæmatoma will lead to a certain amount of tenderness, and the temperature will be irregular, without the patient being otherwise apparently ill. If abdominal dressings have been used this complication is generally discovered when they are removed, at the end of the week.

Depending upon the size of the hæmatoma the surgeon may decide to leave it alone or may open the wound, scrape the blood-clot out, re-suture the wound, or apply an anti-septic dressing.

*Abscess.*—An abscess of the abdominal wound is generally due to an infected suture or ligature, or to infection of a hæmatoma. It may declare itself in a few days, or not perhaps for months later. Pain and tenderness, a rise of temperature, redness and swelling at some spot along the site of the wound are its leading symptoms.

*Sloughing.*—Occasionally, especially if the operation has been a long one and the retraction of the abdominal wall has been prolonged, and virulent bacteria are present in the



tissues removed, such as occurs in cancer of the uterus, the whole of the abdominal incision will slough. Such a complication is more likely if the resisting power of the patient has been lowered by a severe illness. A high temperature and pain in the region of the wound will lead to its examination. Part of the muscle layer often sloughs and the discharge is extremely offensive. Such a condition will require hot fomentations, together with frequent irrigation with a disinfectant (of which peroxide of hydrogen, 10 volumes, will do

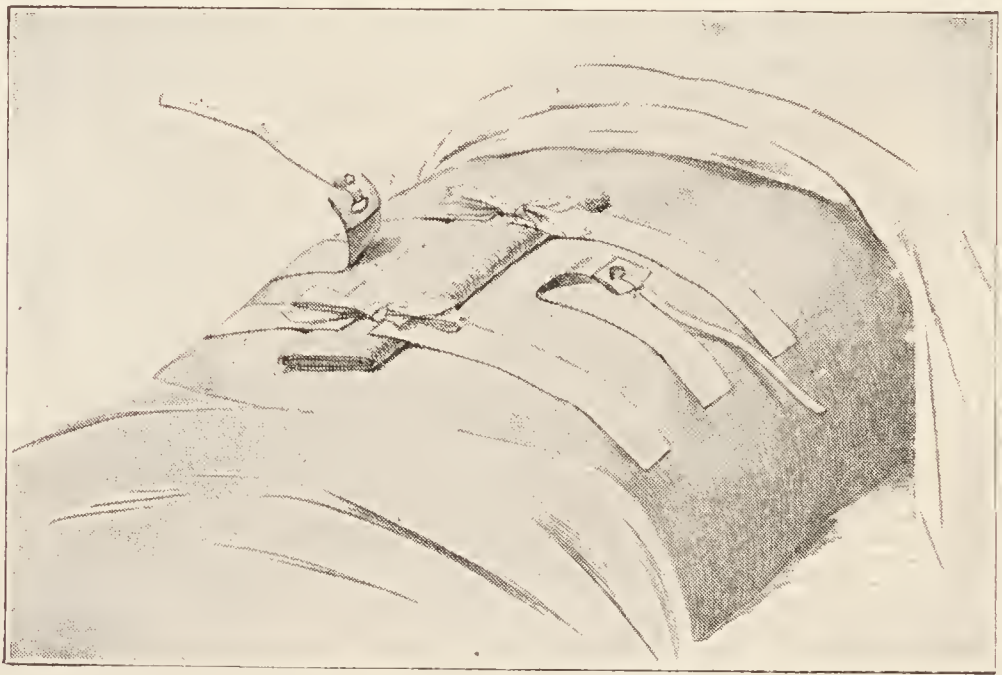


FIG. 72.—ARRANGEMENT OF PLASTER AND TAPES.

Note the free end of the tape turned inwards to prevent it sticking to the dressing and also to form a firmer attachment for the tape.

very well), till the wound is clean, after which it must be dressed as the surgeon directs.

The dressing is best kept in place, and the facility with which the wound can be dressed is greatly increased, by the use of tape and plaster. Pieces of strapping 5 inches long by 1 inch broad should be cut and a tape  $\frac{1}{4}$  inch broad should be sewn to one end of each. The strapping is then applied to the abdominal wall so that the end the tape is attached to reaches not nearer than 2 inches from the edge of the wound. About six pieces of strapping thus prepared will be required, three on each side. After the wound has been dressed, its edges

can be approximated and the dressing kept in place by tying each piece of tape to the corresponding piece on the opposite side (Fig. 72).

*Sinus*.—A sinus of the abdominal wound may be due to an infected suture or ligature, to the track made by a drainage tube, or to the result of a fæcal, bladder or ureteric fistula. The two former complications occur towards the end of the second week, and are preceded, as a rule, by a rise of temperature. In most cases the fæcal fistula closes in a short time but the sinus may remain for months, and rarely, without further treatment, it remains permanent. The ureteric fistula rarely closes.

*Bursting*.—This, which generally occurs in the first week, is an alarming complication and is generally due to violent fits of retching, vomiting, or coughing. It sometimes happens when there is marked abdominal distension and is more likely to supervene if the patient is fat, owing to the sutures tearing out of the tissues. Occasionally the only cause that can be surmized is, when catgut has been used, that of a too rapid absorption of the parietal sutures.

Either part of the wound or the whole wound may burst. Partial bursting may not occasion any symptoms at first, and it is not until the pulse-rate rises and abdominal pain is complained of, that the abdominal dressings are removed and a coil of intestine, perhaps partly strangulated, is detected. When the whole wound bursts the patient has a sudden and severe pain and suffers from shock. It is peculiar how often partial bursting of the wound is overlooked in the first instance. Fortunately the patients nearly always do well, the fatalities being due to the intestine escaping through the fascial edges of the wound only and then becoming strangulated before the accident is recognized.

When the nurse discovers that the wound has burst she should keep the patient absolutely quiet and cover any protruding intestines with a sterilized towel soaked in warm saline. The dressing should be kept in place by an abdominal binder.

The surgeon will have to clean the intestine, replace it, and re-suture the wound.

**Chloroform Poisoning**.—This condition is far more likely to supervene if there has been septic absorption

before the operation. The cells of the liver are affected so that its function is impaired.

The symptoms and sign, as a rule, appear within the first forty-eight hours. In the worst cases there is marked jaundice, violent vomiting, hæmorrhage from the stomach and coma. In other cases the jaundice is absent. The urine contains acetic and diacetic acid.

The treatment consists in the administration of 1 ounce of glucose, 1 drachm of bicarbonate of soda dissolved in 10 ounces of water, introduced every four hours into the rectum through a funnel and catheter, or a similar mixture of  $\frac{1}{2}$  ounce of glucose, a drachm of bicarbonate of soda to a pint of water given intravenously.

It is a very fatal complication.

### Special Points in the Nursing of a Patient after the Radical Operation for Carcinoma of the Cervix Uteri.

The radical operation for cancer of the neck of the uterus is in most cases more trying to the patient than any other operation concerned with diseases peculiar to women. Indeed, this operation, in an advanced case, is as serious to the patient, and as difficult to perform, as any operation in surgery.

Great responsibility devolves on the nurse who has charge of such cases ; the care of a thoroughly trained and efficient nurse may mean the difference between life and death to the patient.

The following are the chief points to be remembered by the nurse in attendance :—

**Shock.**—Shock is often considerable and at times very marked. This is due, not only to the severity of the operation, but also because in most instances the health of the patient has already been affected by pain, bleeding, and a septic discharge. In addition many of the patients are past middle age.

The usual means of combating shock are stated on page 423.

*Infection of the Bladder.*—During the operation the posterior surface of the bladder has to be stripped from its attachments. This means that its nerve supply is injured and so, for one or two weeks, the patient is unable to empty her



bladder completely, and many of the patients have retention. Because of this incomplete emptying of the bladder, and because of the injury to the blood supply, the bladder is very likely to become infected. Most patients suffer from a little cystitis.

The retention of urine is treated as follows : For the first two days the catheter is passed six hourly, then eight hourly. As a rule the urine is not passed naturally for fourteen days, and in some cases not until the patient is up. In addition the patient is given a hexamine mixture till her discharge. When the patient passes urine naturally the residual urine is drawn off by catheter. When 3 ounces only of residual urine is obtained the catheterization is omitted except once a day at 6 p.m., until there is not any residual urine, when the catheterization is omitted.

*Infection of the Abdominal Wound.*—In a certain number of cases the abdominal incision does not heal in the usual way, generally a little local suppuration appears—more rarely about the fourth day after the operation a very offensive brownish discharge escapes from the bottom of the wound. On the doctor separating the skin, the muscle, fat, and fascia will be found to be sloughing. This serious complication, due to the wound being infected by bacteria, results in the patient becoming toxic.

The wound is treated with hot fomentations till it is clean, combined with a dressing twice daily of peroxide of hydrogen or eusol. In most cases a binder should be used till the wound is clean, after which strapping.

☞ *Diarrhœa.*—In certain cases, and this has been noticed particularly when a strong aperient has been given after the operation, the patient suffers from distressing diarrhœa and a certain amount of incontinence of fæces.

This complication may usually be prevented by giving as the aperient syrup of figs. If diarrhœa supervenes it is best treated with a mixture of bismuth and opium.

*Infection in the Pelvis and of the Remains of the Vagina.*—As regards the pelvis it is not surprising that sepsis, in the region from which the growth has been removed, should occur. A nurse who has seen this operation will remember that the pelvis has been stripped of everything except its

muscles, large blood-vessels, important nerves, and the bladder and rectum. A large cavity is thus formed into which the remains of the vaginal canal opens. At the back of this cavity is the raw surface of the front of the rectum, in front is the raw surface of the back of the bladder, and the floor of the cavity is raw. Bacteria from the rectum or from the vaginal canal invading this cavity can thus easily infect it. The remains of the vaginal walls may slough badly, and in these cases it has been noticed that there has always been a bad vaginal discharge or urinary fistula. The signs usually appear about the fifth day with fever, and a foul discharge. The suppuration generally lasts some time, but usually clears up in a month. Rarely the patient succumbs to an intense toxic condition, and very rarely one of the large blood-vessels in the pelvis is opened by suppuration and the patient dies quickly of hæmorrhage.

*Incontinence of Urine.*—This complication results from sloughing of, or injury to, the ureter or from sloughing of, or injury to, the bladder. In advanced cases the ureter has, at times, to be dissected from the side of the growth, and in every case two or three inches of ureter have to be isolated to enable the operator to get clear of the cancerous tissues. It is not surprising, therefore, that at times the ureter sloughs since its blood supply has been interfered with. If the ureter is injured or sloughs, urine is found to be escaping by the vagina, generally about the tenth day. Likewise the bladder may be injured when it is dissected off the growth, or it may become infected and slough. In the first instance, if the repairing stitches do not hold, or in the second, if the bladder sloughs, a vesico-vaginal fistula results.

The treatment of such a complication requires constant attention. The patient will be much more comfortable if she sits upright on an india-rubber ring and is given baths twice daily, boric lotion douches, and an ointment of zinc ointment and castor oil is applied to the parts over which the urine travels.

The fistula may heal in due course, failing which the patient may be cured by operation or have to use an appliance for the rest of her life. The operations on the ureter consist of implanting the free end of the ureter into the bladder or, if this is impossible, the corresponding kidney has to be removed.

## GLOSSARY

(NOTE.—In the derivations, the Greek words are given in English spelling. Vowels, “a,” “e,” “i,” “o,” have been marked with signs indicating short or long sounds, where this seemed necessary as a guide to pronunciation, *e.g.* in “*ă*cinus” the “a” is short as in “man,” while in “*cā*ro” it is long as in “name”: “*ě*” represents the sound of “e” in “set,” “*ē*” the sound in “scene”: “*ī*” as in “hit,” “*ī*” as in “mind”: “*ō*” as in “lot,” “*ō*” as in “tone.”)

**Acinus.** (L. *ă*cinus, grape.) The smallest lobules of a compound gland, *e.g.* the breast; also a dilatation forming the end of a small passage, *e.g.* air sacs of lungs.

**Adenomyoma** or **Endometrioma.** (G. *adēn*, gland; *mus*, muscle; *-ōma*, tumour.) A tumour composed of glandular and muscular tissue.

**Adhesion.** (L. *adhærēre*, to stick to.) The joining together of parts which normally should not be joined.

**Alchemist.** (Of doubtful derivation.) One who practised alchemy, supposed art of transmuting metal into gold and of finding a remedy for all diseases.

**Amenorrhœa.** (G. *a*, no; *mēn*, month; *rhoia*, flow.) Absence or abnormal cessation of the periods.

**Amnion.** (G. *amnion*, lamb.) The inner of the two fœtal membranes.

**Amœba.** (*amoibē*, change.) A protozoon.

**Ampullary.** (L. *ampulla*, a jug.) A dilatation like a flask. Ampullary layer, the dilated glands forming part of the decidua.

**Anæmia.** (G. *an*, no; *haima*, blood.) A condition in which the blood is deficient in hæmoglobin or in the number of red blood corpuscles.

**Anaphylaxis.** (G. *ana*, against; *phulaxis*, protection.) A condition of super-sensitiveness produced by a first injection of serum which lowers the immunity of the person injected.

**Antibodies.** Substances secreted by the cells of the body to protect itself against the results of bacterial infection.

**Ascites.** (G. *askos*, bag.) A collection of serous fluid in the peritoneal cavity.

**Atresia.** (G. *a*, no; *trēs*is, boring.) Absence or closure of a normal opening, *e.g.* of the cervical canal.



- Atrophy.** (G. *a*, no ; *trōphē*, nourishment.) A wasting or diminution in the size of a part, defect or failure of nutrition.
- Bacteriolysin.** (*bacteria* : G. *lūsis*, dissolution.) An anti-body which shrinks, or breaks up, bacteria.
- Bacterium.** (G. *bakterion*, a little rod.) A single vegetable cell belonging to the lowest form of life.
- Blastocyst.** (G. *blāstos*, germ ; *kustis*, cyst.) The developing zygote.
- Cachexia.** (G. *kākos*, ill ; *hexis*, habit.) State of marked ill-health or malnutrition.
- Capsule.** (L. *capsula*, little box.) Supra-renal capsule, a small organ on anterior upper surface of kidney.
- Carious.** (L. *cariōsus*, rotten.) Dental caries, damage to enamel and dentine of teeth by acid-producing bacteria.
- Caruncle.** (L. *caruncula*, diminutive from *cāro*, flesh.) A small fleshy eminence, *e.g.* urethral caruncle.
- Chlorosis.** (G. *chlōros*, green.) A form of anæmia affecting girls at puberty, characterized by its greenish colour.
- Chorion.** (G. *choreon*, skin.) The outer of the two foetal membranes.
- Coccygodynia.** (G. *kokkux*, coccyx ; *odunē*, pain.) Pain in region of coccyx due to neuralgia or injury.
- Colpo-perineorrhaphy.** (G. *kolpos*, vagina ; *perinaion*, perineum ; *raphē*, suture.) Removing a piece of the posterior vaginal wall, suturing the edges, and repairing the damaged perineal body.
- Colporrhaphy.** (G. *kolpos*, vagina ; *raphē*, suture.) The operation of narrowing the vagina by removing a piece of its wall and suturing the cut edges.
- Colpotomy.** (G. *kolpos*, vagina ; *temnein*, to cut.) Cutting through the vagina into the pouch of Douglas.
- Coma.** (G. *kōma*, stupor.) Unconsciousness occurring in the course of disease or following severe injury.
- Condylomata.** (G. *konduloma*, wart.) A wart-like excrescence near the anus or vulva, seen in cases of syphilis.
- Convulsions.** (L. *convellere*, to pull together.) Violent involuntary contractions of the voluntary muscles.
- Corpuscle.** (L. *corpusculum*, little body.) Usually refers to cells of the blood.
- Cystic.** (G. *kustis*, bladder.) A sac normal or otherwise, especially one containing a liquid or semi-solid.
- Cystocele.** (G. *kustis*, bladder ; *kēlē*, hernia.) Bulging of the bladder with the anterior vaginal wall.
- Decidua.** (L. *dēciduus*, falling off.) Lining of pregnant uterus, which is cast off after labour.
- De-hydrate.** (L. *dē*, away ; G. *hūdōr*, water.) Removal of water from a substance.
- Diathermy.** (G. *dia*, through ; *thermainein*, to warm.) A form of electrical cautery in which the current enters by a large pad on the back and leaves at the point of the particular instrument being used. Also used for warming up local parts of the body.
- Dysmenorrhœa.** (G. *dus*, difficult ; *mēn*, month ; *rhoia*, flow.) Painful menstruation.

- Dyspnœa.** (G. *dus*, difficult ; *pnoē*, breathing.) Difficult or laboured breathing.
- Eclampsia.** (G. *ek*, out ; *lampein* to flash.) An attack of convulsions.
- Ectopic.** (G. *ektopos*, displaced.) Out of normal place : ectopic gestation, a fertilized ovum developing outside the uterus.
- Embolism.** (G. *en*, in ; *ballein*, to throw.) Blocking of an artery or vein, by a clot carried in the blood-stream. If pulmonary artery is blocked death from suffocation may occur.
- Embryo.** (G. *endon*, within ; *bruein*, to grow.) The foetus during its development.
- Empirical.** (G. *empirikos*, experimental.) Based on experience.
- Endo-cervicitis.** (G. *endon*, within ; *cervix*, neck ; *itis*, inflammation.) Inflammation of lining of neck of uterus.
- Endocrin.** (G. *endon*, within ; *krīnein*, to separate.) Endocrin glands, ductless glands with an internal secretion, *e.g.* the ovaries, adrenals, thyroid, pituitary.
- Endometrium.** (G. *endon*, within ; *mētra*, uterus.) Mucous membrane lining the uterus.
- Epithelioma.** (G. *epi*, on ; *thēlē*, nipple ; *ōma*, tumour.) A cancer consisting of epithelial cells.
- Erosion.** (L. *ērōdēre*, to eat out.) The eating away of a part.
- Exsanguinated.** (L. *ex*, out ; *sanguinis*, blood.) Deprived of blood.
- Extravasation.** (L. *extrā*, beyond ; *vas*, vessel.) Escape of blood from a vessel into the tissues.
- Fascia.** (L. *fascia*, band.) A sheet of tissue which invests the muscles.
- Fistula.** (L. *fistula*, pipe.) An opening into a hollow internal organ, *e.g.* vesico-vaginal fistula, an opening between bladder and vagina.
- Follicle.** (L. *folliculus*, a little bag.) A small excreting or secreting sac or gland.
- Fornix.** (L. *fornix*, arch.) That portion of the vagina above the level of the external os, thus anterior, posterior and lateral, according to the position.
- Gamete.** (G. *gametēs*, spouse.) Sexual cells, male and female, which unite with each other to form the zygote.
- Hæmatoma.** (G. *haima*, blood ; *ōma*, tumour.) A swelling due to effused blood.
- Hæmato-salpinx.** (G. *haima*, blood ; *ōma*, tumour ; *salpinx*, trumpet.) Collection of blood in the Fallopian tube.
- Hæmophilia.** (G. *haima*, blood ; *philein*, to love.) An abnormal tendency to bleed, usually hereditary.
- Hermaphrodism.** (G. *hermēs*, Mercury ; *aphrodītē*, Venus.) Hermaphrodite, an animal which has both male and female sexual organs. There is no reported case in the literature of a human person having both ovaries and testes ; all supposed cases are really pseudo-hermaphrodites.
- Hydro-salpinx.** (G. *hydrō*, water ; *salpinx*, trumpet.) Collection of watery fluid in a Fallopian tube.

- Hyperæmia.** (G. *huper*, over ; *haima*, blood.) Excess of blood in any part of the body.
- Hyperemesis.** (G. *huper*, over ; *emēsis*, vomiting.) Hyperemesis gravidarum, the excessive vomiting of pregnancy.
- Hypertropic.** (G. *huper*, over ; *trophē*, nutrition.) Excessive enlargement of a part.
- Hypospadias.** (G. *hupo*, under ; *spān*, to draw.) Congenital opening of urethra on the underside of penis, or an opening of the urethra into the vagina.
- Hysterectomy.** (G. *hutera*, uterus ; *ectomē*, excision.) Removal of the uterus either by abdominal route or through the vagina.
- Inflammation.** (L. *inflammātus*, set on fire.) Condition of the tissues as a result of irritation.
- Leucorrhœa.** (G. *leukos*, white ; *rhoia*, flow.) Any discharge from the genital canal not consisting of blood, pus, water, or fæces ; used for excessive secretion of the mucous membrane of the uterus.
- Leukoplakia.** (G. *leukos*, white ; *plex*, plate.) A disease characterized by the formation of white patches on the tongue or on the inner surface of the vulva.
- Levator Ani.** (L. *levātor*, lifter.) The muscle that supports and lifts the rectum and vagina, aids defæcation.
- Lipiodol.** A compound of iodine in poppyseed oil : it contains 40 per cent. of iodine, but is non-toxic.
- Lithopædion.** (G. *lithos*, stone ; *paidion*, child.) A dead fœtus which has become calcified.
- Lumen.** (L. *lumēn*, light.) The clear space inside a tube.
- Malignant.** (L. *maligans*, acting maliciously.) A condition leading to death.
- Meatus.** (L. *meātus*, passage.) Meatus urinarius, the orifice of the urethra.
- Menopause.** (G. *mēn*, month ; *pausis*, cessation.) The age when menstruation normally ceases.
- Menorrhagia.** (G. *mēn*, month ; *rhēgnunai*, to burst forth.) Profuse menstruation.
- Menses.** (L. *mensis*, month.) The monthly flow of blood, mucus, and shreds of endometrium from the uterus of woman.
- Menstruation.** (L. *menstruāre*, menstruate.) A physiological function associated with the discharge of the menses.
- Metrorrhagia.** (G. *mētra*, uterus ; *rhēgnunai*, to burst forth.) An abnormal uterine hæmorrhage.
- Multicellular.** (L. *multus*, many ; *cellulă*, cell.) Composed of many cells.
- Myomectomy.** (G. *mus*, muscle ; *ōma*, tumour ; *ektomē*, excision.) Enucleation of a fibroid tumour from the uterus.
- Myxœdema.** (G. *muxa*, mucus ; *oidēma*, swelling.) A disease characterized by dropsy of the face and hands, due to atrophy of the thyroid gland.
- Nodule.** (L. *nōdulus*, little knot.) A small swelling.
- Œdema.** (G. *œdēma*, swelling.) Swelling due to effusion of watery fluid into the connective tissue.



- Oocyte.** (G. *ōon*, egg ; *kutos*, cell.) The unfertilized cell which escaped from a *Graafian* follicle in the ovary when it ruptured. Otherwise called the ovum, egg, or female gamete.
- Oophorectomy.** (G. *ōon*, egg ; *pherein*, to bear ; *ektomē*, excision.) Excision of an ovary.
- Opsonin.** (G. *opsōnein*, to prepare food for.) An anti-body which makes the bacteria palatable to the phagocyte.
- Oxidize.** To combine or to cause to combine with oxygen.
- Paretic.** (G. *paresis*, relaxation.) Affected with paresis, paralysis.
- Pedunculated.** (L. *pedunculus*, a stem.) Having a stem.
- Perineorrhaphy.** (G. *perinaion*, perineum ; *raphē*, suture.) The operation of making a new perineum.
- Phagocytes.** (G. *phagein*, to eat ; *kutos*, cell.) Cells which destroy bacteria by enveloping and absorbing them.
- Placenta.** (L. *placenta*, a flat cake.) The organ, partly maternal and partly fœtal, situated in the pregnant uterus which is the means of conveying nourishment to, and waste products from, the fœtus.
- Plastic.** (G. *plasticos*, to build up.) Tending to build up tissue or restore a lost part.
- Polypus.** (G. *polus*, many ; *pous*, feet.) A pedunculated growth from a mucous surface.
- Prophylactic.** (G. *pro*, before ; *phulasso*, to guard.) Tending to prevent a disease.
- Protozoon.** (G. *prōtos*, first ; *zōon*, animal.) A single animal cell belonging to the next lowest form of life to a bacterium.
- Pruritus.** (L. *prurire*, to itch.) Pruritus vulvæ, itching of external genital organs of the female.
- Pseudocyesis.** (G. *pseudēs*, false ; *kukēsis*, pregnancy.) A condition in which a woman thinks she is pregnant when she is not.
- Purulent.** (L. *purulentus*, containing pus.) Consisting of pus.
- Pus.** (L. *pus*.) The result of inflammation, a secretion consisting of dead cells and a thin fluid.
- Pyæmia.** (G. *puon*, pus ; *haima*, blood.) Septicæmia characterized by the formation of local abscesses.
- Pyo-salpinx.** (G. *puon*, pus ; *salpinx*, trumpet.) Collection of pus in Fallopian tube.
- Salpingectomy.** (G. *salpinx*, trumpet ; *ektomē*, excision.) Removal of a Fallopian tube.
- Salpingostomy.** (G. *salpinx*, trumpet ; *stōma*, mouth.) The formation of a new opening into a Fallopian tube, the lumen of which has closed, in an attempt to cure one form of sterility.
- Saprophytes.** (G. *saphros*, putrid ; *phuton*, plant.) Bacteria living on dead or decaying organic matter.
- Sarcoma.** (G. *sarx*, flesh ; *ōma*, tumour.) A malignant fleshy tumour.
- Sclerosis.** (G. *sklērōsis*, hardness.) An induration or hardening.
- Sebaceous.** (L. *sebāceus*, pertaining to sebum or suet.) Sebaceous gland, one secreting an oily substance.
- Sordes.** (L. *sordēs*, filth.) The mixture of epithelial débris and bacteria which collect on teeth and lips in low fevers.

- Spermatozoon.** (G. *sperma*, seed ; *zōon*, animal.) The male gamete or sexual cell.
- Spore.** (G. *spōră*, seed.) The resting stage of a bacillus when its environment is not conducive to its reproduction, to be transformed into a bacillus when the surroundings are again favourable.
- Squamous.** (L. *squāmōsus*, scaly.) Plate-like.
- Suppuration.** (L. *sub*, under ; *puon*, pus.) The formation of pus.
- Tertiary.** (L. *tertiārius*, third in order.) Tertiary syphilis, or its third stage.
- Therapy.** (G. *therapeuein*, to wait on, cure.) Treatment of disease.
- Thrombus.** (G. *thrombos*, clot.) Clot in a blood-vessel remaining at the point of its formation.
- Toxæmia.** (G. *toxikon*, poison ; *haima*, blood.) Poisons produced by the body cells or by bacteria.
- Trachelorrhaphy.** (G. *trachēlos*, neck ; *rhapḗ*, suture.) The repair of a lacerated cervix uteri.
- Tungsten.** A metallic element.
- Unilateral.** (L. *ūnus*, one ; *latus*, side.) Affecting one side only.
- Uræmia.** (G. *ouron*, urine ; *haima*, blood.) The presence of urinary constituents in the blood.
- Ventral Fixation.** (L. *venter*, belly ; *fixus*, fixed.) The cure of uterine retroposition by fixing the uterus to the abdominal wall.
- Vesicular.** (L. *vesicula*, a little bladder.) Composed of small sac-like bodies.
- Voltage.** Electromotive strength measured in volts.
- Vulvitis.** (L. *vulva* ; G. *itis*, inflammation.) Inflammation of the vulva.
- Zygote.** The fertilized cell resulting from fusion of the oocyte and spermatozoon. (See Gametes.)
- Zymosis.** (G. *zumoein*, to ferment.)
- Zymotic.** An infectious or contagious disease.

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